REPORT OF AIR POLLUTION SOURCE TESTING OF AN ETHYLENE OXIDE EMISSION-CONTROL SYSTEM OPERATED BY STERIGENICS, INC. IN GRAND PRAIRIE, TEXAS ON MAY 22, 2018

Submitted to:

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
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Submitted by:

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Permit Number 51907

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Prepared on:

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1.0 INTRODUCTION

On Tuesday, May 22, 2018, ECSi performed air pollution source testing of an ethylene oxide (EtO) emission-control system operated by Sterigenics, Inc. in Grand Prairie, Texas. The control system tested was a Maxon Catalytic Oxidizer, which is used to control emissions from five commercial EtO sterilizer backvents, and one aeration room. The purpose of the testing program was to evaluate continued compliance with the conditions established in the Air Quality Permit granted to Sterigenics, Inc. by the Texas Commission on Environmental Quality (TCEQ).



2.0 EQUIPMENT

The gas-sterilization system is comprised of five commercial sterilizers, all discharging through liquid-ring vacuum pumps to an Advanced Air Technologies packed-tower acid scrubber emission control device. One aeration room and five sterilization chamber backvents are all discharged to a Maxon catalytic oxidizer emission-control device. The gas-sterilization and emission-control equipment currently consists of the following:

- Three Vacudyne commercial ethylene oxide gas sterilizers, each comprised of a steam-heated sterilization chamber (30 pallet capacity), and a Dekker 3-pump oil-sealed liquid ring recirculating vacuum pump skid (two 50 hp liquid ring pumps, plus one 25 hp booster pump);
- Two Trumbo commercial ethylene oxide gas sterilizers, each comprised of a steam-heated sterilization chamber (30 pallet capacity), and a Dekker 3-pump oil-sealed liquid ring recirculating vacuum pump skid (one 50 hp liquid ring pump, plus one 25 hp booster pump);
- One 12,200 square foot aeration room, comprised of a heated aeration chamber and an exhaust system.

Sterilizer vacuum pump emissions are controlled by:

 One Advanced Air Technologies Safe Cell I emission-control system, comprised of a packed-tower chemical scrubber, equipped with a packed reaction/interface column, a scrubber fluid recirculation system (2 recirculation pumps - 1 primary and 1 backup - each @ 350 gpm and 15 hp), and two scrubber fluid reaction/storage tanks.

Aeration and backvent emissions are controlled by:

 One Maxon catalytic oxidizer, 15,000 SCFM, equipped with a prefilter, a gas-fired heater, a reactive catalyst bed, and an exhaust blower.



3.0 TESTING

EtO source testing was conducted in accordance with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in 40 CFR, Part 63.365, subpart O. EtO concentration measurement for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer was determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product. The testing program was conducted in accordance with the procedures outlined in the following sections.



4.0 RULE/COMPLIANCE REQUIREMENTS

The EtO gas-sterilization system at Sterigenics, Inc. was tested to evaluate compliance with the requirements specified in the TCEQ Permit. The current testing was performed to demonstrate continued compliance with the following requirement:

Aeration and backvent emissions must be discharged to control equipment which achieves an EtO
emission-reduction efficiency of at least 99.0%, or an outlet EtO concentration of no greater than 1
ppmv.

Testing is required to demonstrate compliance with these requirements. Source testing of the emission-control device is required initially, and may be required periodically thereafter.

5.0 TEST METHOD REFERENCE

5.1 INTRODUCTION

EtO source testing was conducted in accordance with the procedures outlined in CARB Method 431, the USEPA approved alternate method to the procedures listed in 40 CFR, Part 63.365, subpart O. EtO concentration measurement for each test run was conducted simultaneously at the inlet and outlet of the catalytic oxidizer during chamber backvent, and during a one-hour interval of the 24-hour aeration process. A total of three chamber backvent test runs, and three one-hour aeration test runs, were performed.

During backvent and aeration testing, EtO concentration at the inlet and the outlet of the catalytic oxidizer were determined using direct source sample injection into the gas chromatograph (GC). All backvent and aeration testing was performed using freshly sterilized product.

Operation and documentation of process conditions was performed by personnel from Sterigenics, Inc. using existing monitoring instruments installed by the manufacturer of the equipment to be tested. In accordance with TCEQ requirements, and the procedures established in USEPA 40 CFR, Part 63.365, Subpart O, the following parameter was recorded: operating temperature at the catalyst bed outlet, using the thermocouple associated with catalyst bed #1, which is located closest to the oxidizer outlet.

5.2 CONTROL EFFICIENCY MEASUREMENT

During backvent and aeration testing, EtO concentration at the inlet and outlet of the catalytic oxidizer were determined using direct source sample injection into the GC. Since the source gas flow is identical at the inlet and outlet of the catalytic oxidizer control-efficiency of EtO during aeration and backvent was calculated by comparing the concentration of EtO vented to the system inlet to the concentration of EtO vented from the system outlet.

CARB Method 431, Appendix A, specifies that catalytic oxidizer emission-control devices may be tested, and control efficiency determined, without volumetric flow measurement as long as the following criteria are met:

- 1) There is no dilution between the inlet and outlet sampling locations
- 2) There is identical flow at the inlet and outlet sampling locations, and
- 3) There is constant flow throughout the duration of the compliance test.



These conditions were all met during the testing performed at Sterigenics. Specifically, condition 2 was met due to the extremely high flow rate of ambient air being drawn through the oxidizer (15,000CFM) which, when compared to the relatively low flow rate of natural gas to the heater burner, renders the potential contribution of any fuel gas combustion products to the outlet flow rate to be extremely negligible. In addition, emissions testing for combustion products performed on similar gas-fired catalytic oxidizers used to control EtO emissions has demonstrated that the exhaust gas composition at the outlet of the oxidizer contains moisture, oxygen, carbon dioxide, and carbon monoxide at ambient levels, and that any deviations are at low ppmv levels. This is further proof that the potential contribution of any fuel gas combustion products to the outlet flow rate is insignificant.

During the backvent and aeration phases, vented gas was analyzed by an SRI, Model 8610, portable gas chromatograph (GC), equipped with the following: dual, heated sample loops and injectors; dual columns; and dual detectors. A flame ionization detector (FID) was used to quantify inlet EtO concentration, and a photoionization detector (PID) was used to quantify low-level EtO concentration at the emission-control device outlet.

5.3 SAMPLE TRANSPORT

Source gas was pumped to the GC at approximately 1000 cubic centimeters per minute (cc/min) from the sampling ports through two lengths of Teflon[®] sample line, each with a nominal volume of approximately 75 cubic centimeters (cc) and an outer diameter of 0.25 inch. At the inlet, the sampling port was located in the common backvent/aeration discharge duct, upstream of the oxidizer. At the outlet of the catalytic oxidizer, sampling ports were located in the exhaust stack downstream of the catalyst bed.

5.4 GC INJECTION

Source-gas samples were then injected into the GC which was equipped with two heated sampling loops, each containing a volume of approximately 2cc and maintained at 100 degrees Celsius (C). Injections occurred at approximately five minute intervals during the aeration-phase testing. Helium was the carrier gas for both the FID and PID.



5.5 GC CONDITIONS

The packed columns for the GC were both operated at 80 degrees C. The columns were stainless steel, 6 feet long, 0.125 inch outer diameter, packed with 1 percent SP-1000 on 60/80 mesh Carbopack B. During the analysis, the FID was operated at 250 degrees C. The support gases for the FID were helium (99.999% pure), hydrogen (99.995% pure) and air (99.9999% pure). Any unused sample gas was vented from the GC system back to the inlet of the control device being tested.

5.6 CALIBRATION STANDARDS

The FID was calibrated for mid-range part-per-million-by-volume (ppmv) level analysis using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

The PID was calibrated for low-range ppmv level analyses using gas proportions similar to the following:

- 1) 100 ppmv EtO, balance nitrogen
- 2) 50 ppmv EtO, balance nitrogen (audit gas)
- 3) 10 ppmv EtO, balance nitrogen
- 4) 1 ppmv EtO, balance nitrogen

Each of these calibration standards was in a separate, certified manufacturer's cylinder. Copies of the calibration gas laboratory certificates are attached as Appendix I.

5.7 SAMPLING DURATION

Backvent testing was performed in conjunction with normal production operations, during the chamber exhaust venting which is conducted for each sterilization chamber upon conclusion of the sterilization cycle, immediately prior to and during chamber unloading. Backvent sampling duration was 15 minutes for each of the three test runs.

Since aeration is a 24-hour process at this facility, with constant discharge flow from the aeration chambers to the emission-control system, aeration testing consisted of three 1-hour test runs. Each test run was performed with freshly sterilized product in the aeration chambers.

5.8 CONTROL-EFFICIENCY CALCULATIONS

Control efficiency of EtO was calculated for aeration and backvent, using the following CARB-approved equation:

Efficiency = $(C_i - C_o / C_i)(100)$

Which is a mathematical simplification of the following equation from CARB Method 431, with the identical inlet/outlet flow value removed:

Efficiency = $(W_i - W_o / W_i)(100)$

Where:

 W_i = Mass flow rate to the control device inlet, pounds, calculated as $(C_i)(F_i)$

Where:

C_i = EtO concentration at the control device inlet

 F_i = Flow rate at the control device inlet

 W_0 = Mass flow rate from the control device outlet, pounds, calculated as $(C_0)(F_0)$

Where:

 C_0 = EtO concentration at the control device outlet

 F_0 = Flow rate at the control device outlet

Results of the control-efficiency testing are presented in Section 8.0, and in Tables 1 and 2.

6.0 TEST SCENARIO

The backvent and aeration testing was performed during normal process load conditions. Three backvent and three aeration test runs were conducted in series to verify the performance of the emission-control device. The testing schedule was as follows:

- 1) Testing equipment was set up and calibrated.
- 2) Backvent Phase Test Run #1 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 3) Aeration Phase Test Run #1 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 4) Aeration Phase Test Run #2 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 5) Backvent Phase Test Run #2 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 6) Aeration Phase Test Run #3 was conducted with freshly sterilized product in aeration. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 7) Backvent Phase Test Run #3 was conducted with one freshly sterilized production load. Sampling was performed at the inlet and the outlet of the catalytic oxidizer.
- 8) Post calibration check was performed, testing equipment was packed.



7.0 QA/QC

7.1 FIELD TESTING QUALITY ASSURANCE

At the beginning of the test, the sampling system was leak checked at a vacuum of 15 inches of mercury. The sampling system was considered leak free when the flow indicated by the rotameters fell to zero.

At the beginning of the test, a system blank was analyzed to ensure that the sampling system was free of EtO. Ambient air was introduced at the end of the heated sampling line and drawn through the sampling system line to the GC for analysis. The resulting chromatogram also provided a background level for non-EtO components (i.e. ambient air, carbon dioxide, water vapor) which are present in the source gas stream due to the ambient dilution air which is drawn into the emission-control device, and due to the destruction of EtO by the emission-control device which produces carbon dioxide and water vapor. This chromatogram, designated AMB, is included with the calibration data in Appendix A.

7.2 CALIBRATION PROCEDURES

The GC system was calibrated at the beginning and conclusion of each day's testing. Using the Peaksimple II analytical software, a point-to-point calibration curve was constructed for each detector. A gas cylinder of similar composition as the calibration gases, but certified by a separate supplier, was used to verify calibration gas composition and GC performance.

All calibration gases and support gases used were of the highest purity and quality available. A copy of the laboratory certification for each calibration gas is attached as Appendix I.



8.0 TEST RESULTS

The catalytic oxidizer was found to have an average EtO control efficiency of 99.98 percent for backvent, and an average EtO control efficiency of 99.98 percent for aeration. In accordance with state and federal requirements, backvent and aeration discharge streams must be vented to control equipment with an EtO emission-reduction efficiency of at least 99 percent. The catalytic oxidizer met this requirement.

The test results are summarized in Tables 1 and 2. These tables include results for EtO control efficiency of the emission-control device. Chromatograms and chromatographic supporting data are attached as Appendices A through G. Copies of field data and calculation worksheets are attached as Appendix H.



TABLES

TABLE 1 ETHYLENE OXIDE CONTROL EFFICIENCY - BACKVENT OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS, INC. IN GRAND PRAIRIE, TEXAS ON MAY 22, 2018

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	849	51.1	0.01	99.9804
1	850	49.7	0.01	99.9799
1	852	124	0.01	99.9919
1	853	65.0	0.01	99.9846
1	854	57.5	0.01	99.9826
1	855	54.6	0.01	99.9817
1	856	53.7	0.01	99.9814
1	858	49.5	0.01	99.9798
1	859	49.7	0.01	99.9799
1	900	49.7	0.01	99.9799
1	901	48.4	0.01	99.9793
1	903	49.4	0.01	99.9798
2(4)	911	52.9	0.01	99.9811
2	912	115	0.01	99.9913
2	913	80.2	0.01	99.9875
2	915	61.6	0.01	99.9838
2 2 2	916	57.1	0.01	99.9825
2	917	57.1	0.01	99.9825
2 2	918	54.8	0.01	99.9818
	920	56.4	0.01	99.9823
2 2 2	921	55.9	0.01	99.9821
2	923	56.9	0.01	99.9824
	924	58.5	0.01	99.9829
2	925	58.1	0.01	99.9828
3(5)	1407	62.8	0.01	99.9841
3	1408	64.6	0.01	99.9845
3	1409	60.6	0.01	99.9835
3 3 3	1410	60.2	0.01	99.9834
3	1411	52.4	0.01	99.9809
3	1413	52.8	0.01	99.9811
3 3	1414	53.1	0.01	99.9812
3	1415	53.6	0.01	99.9813
3 3 3	1416	58.2	0.01	99.9828
3	1418	57.6	0.01	99.9826
	1419	56.9	0.01	99.9824
3	1420	<u>57.7</u>	<u>0.01</u>	<u>99.9827</u>
TIME-W	EIGHTED AVERAGE:	59.93	0.0100	99.9826

TCEQ REQUIRED CONTROL EFFICIENCY:

Notes:

- (1) PPM = parts per million by volume
- (2) 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) Backvent Phase Test Run #1 started at 8:49, ended at 9:04.
- (4) Backvent Phase Test Run #2 started at 9:10, ended at 9:25.
- (5) Backvent Phase Test Run #3 started at 14:06, ended at 14:21.
- (6) During backvent testing, the average recorded catalyst bed temperature was 345 deg F

99%

TABLE 2 ETHYLENE OXIDE CONTROL EFFICIENCY - AERATION OF AN ETHYLENE OXIDE EMISSION CONTROL DEVICE OPERATED BY STERIGENICS, INC. IN GRAND PRAIRIE, TEXAS ON MAY 22, 2018

RUN <u>NUMBER</u>	INJECTION <u>TIME</u>	INLET ETO CONC. (PPM)(1)	OUTLET ETO CONC. (PPM)(2)	ETO CONTROL EFFICIENCY
1(3)	927	53.1	0.01	99.9812
1	932	52.1	0.01	99.9808
1	937	53.3	0.01	99.9812
1	942	55.1	0.01	99.9819
1	947	58.0	0.01	99.9828
1	952	68.1	0.01	99.9853
1	957	68.7	0.01	99.9854
1	1002	65.1	0.01	99.9846
1	1007	65.0	0.01	99.9846
1	1012	66.4	0.01	99.9849
1	1017	63.2	0.01	99.9842
1	1022	66.5	0.01	99.9850
2(4)	1027	50.0	0.01	99.9800
2	1032	50.1	0.01	99.9800
	1037	48.3	0.01	99.9793
2 2 2 2	1042	57.8	0.01	99.9827
2	1047	57.7	0.01	99.9827
2	1052	52.8	0.01	99.9811
2	1057	53.4	0.01	99.9813
2	1102	51.1	0.01	99.9804
	1107	64.2	0.01	99.9844
2 2 2	1112	63.9	0.01	99.9844
2	1117	69.6	0.01	99.9856
2	1122	66.8	0.01	99.9850
3(5)	1127	61.0	0.01	99.9836
3	1132	56.3	0.01	99.9822
3	1137	56.3	0.01	99.9822
3	1142	63.6	0.01	99.9843
3 3	1147	63.4	0.01	99.9842
3	1152	61.8	0.01	99.9838
3	1157	62.7	0.01	99.9841
3	1202	61.4	0.01	99.9837
3	1207	59.9	0.01	99.9833
3 3 3	1212	58.7	0.01	99.9830
3	1217	56.7	0.01	99.9824
3	1222	<u>53.7</u>	<u>0.01</u>	<u>99.9814</u>
TIME-W	EIGHTED AVERAGE:	59.33	0.0100	99.9830

TCEQ REQUIRED CONTROL EFFICIENCY:

Notes:

- (1) PPM = parts per million by volume
- (2) 0.01 ppm is the quantification limit for the detector used at the outlet.
- (3) Aeration Phase Test Run #1 started at 9:25, ended at 10:25.
- (4) Aeration Phase Test Run #2 started at 10:25, ended at 11:25.
- (5) Aeration Phase Test Run #3 started at 11:25, ended at 12:25.
- (6) During aeration testing, the average recorded catalyst bed temperature was 345 deg F

99%

APPENDICES



APPENDIX A

Calibration Data



EtO Calibrations

~			
	4	Δ	•

STERIGENICS - GRAND PRAIRIE, TX

Date:

5/22/2018

INLET - FID

ppm	. 0	1.10	10.1	100	1,000	10,080
Area 1	0	0.407	3.81	37.1		
Area 2	0	0.409	3.74	37.2		
Area 3	0	0.410	3.78	37.4		
AVG.	0	0.409	3.78	37.2	#DIV/0!	#DIV/0!

AUDIT
48.8
READS
49.8
2.0%

Dev.

OUTLET - PID

ppm	0	1.10	10.1	100
Area 1	0	1.89	16.6	162
Area 2	0	1.87	17.1	164
Area 3	0	1.90	16.7	164
AVG.	0	1.89	16.8	163

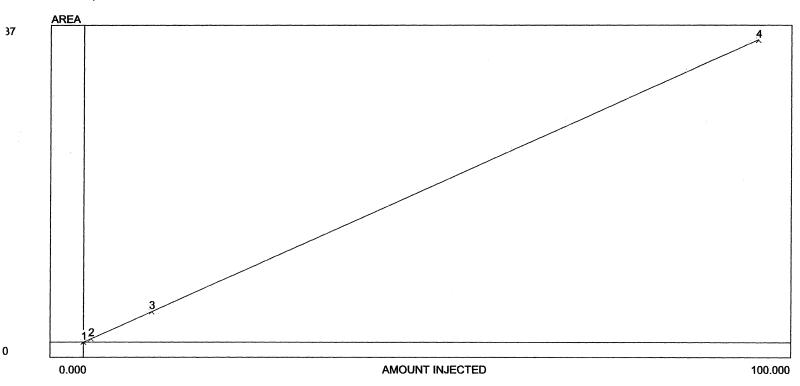
AUDIT
48.8
READS
48.6
-0.4%

Dev.

		LO	D Cal	culation Et)		
	STE	RIGEN	ICS - C	GRAND PRA	R	IE, TX	
		·	5/2	2/2018	,	1	
			Y =	A	+	m	x
Outlet			ppm =	7.95E-04	+	0.61296	x area
Lowest Cal Gas				R2	=	1.00000	
				Corr. Coeff.	=	1.00000	
	Area	Calc ppr	n	LOD	=	A + 3s	
	1.890	1.159	ppm	LOD	=	0.029	ppm
	1.870	1.147	ppm				
	1.900	1.165	ppm				
AVG		1.157	ppm				
Std Dev, s		0.009	ppm				
				1/2 LOD	=	0.014	ppm

Peak Name Start End Calibration Int.Std Units
1 Dead Vol / Air 0.000 0.300 0.000
2 Ambient H2O 0.300 0.450
3 Ethylene Oxide 0.450 0.550 C:\peak359\1Ster0.00018.ppm
4 Acetaldehyde 0.550 0.800 0.000
5 CO2 0.800 1.000 0.000

Calibration file: C:\peak359\1SterGP2018.cal



Avg slope of curve: 0.37 Y-axis intercept: 0.00 Linearity: 1.00 Number of levels: 4

SD/rel SD of CF's: 0.2/66.7

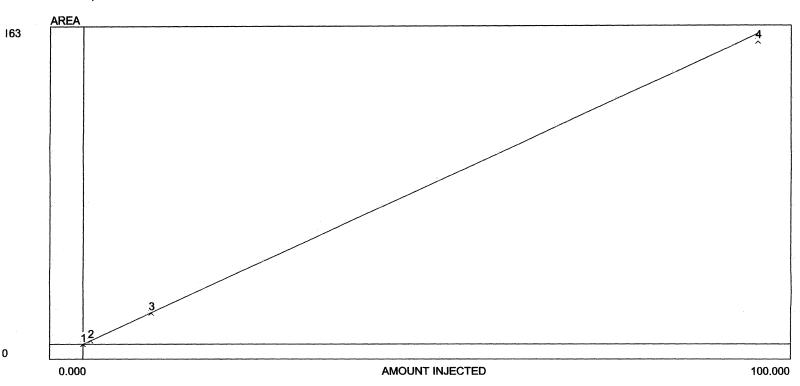
Y=0.3727X r2: 1.0000

Last calibrated: Tue May 22 08:10:10 2018

Lv	I. Area/ht.	Amount	CF	Current	Previou	s #1Previous a	#2
1	0.000	0.000	0.000	0.000	N/A	N/A	
2	0.409	1.100	0.372	0.409	N/A	N/A	
3	3.780	10.100	0.374	3.780	N/A	N/A	
4	37.200	100.000	0.372	37.200	N/A	N/A	

Component file: eto2-100.cpt

² eak	Name	Start	End	Calibration	Int.Std	Units
ł	Dead Vol / Air	0.000	0.300		0.000	
2	Ambient H2O	0.300	0.450		0.000	
3	Ethylene Oxide	0.450	0.550	C:\peak359\2Ster	0.00018	.фрт
1	Acetaldehyde	0.550	0.800		0.000	
5	CO2	0.800	1.000		0.000	



Avg slope of curve: 1.67 Y-axis intercept: 0.00 Linearity: 1.00 Number of levels: 4 SD/rel SD of CF's: 0.8/66.7

Y=1.6705X r2: 1.0000

Last calibrated: Tue May 22 08:09:33 2018

L۷	I. Area/ht.	Amount	CF	Current	Previou	ıs #1Previous #2
1	0.000	0.000	0.000	0.000	N/A	N/A
2	1.890	1.100	1.718	1.890	N/A	N/A
3	16.800	10.100	1.663	16.800	N/A	N/A
4	163.000	100.000	1.630	163.000	N/A	N/A

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-Amb.CHR (c:\peak359) Data file: 2SterGP2018-Amb.CHR (c:\peak359) Sample: Ambient Background Sample: Ambient Background Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 16.000 External/Units -1.600 22.9750/0.083 Dead Vol / Air 0.0000/ 2.8530/0.233 0.0000/ 0.0000/ 171.3780/0.383 0.0000/ Ambient H2O Retention External Units Component Area Component Retention External Units Area Dead Vol / Air 0.233 2.8530 0.0000 Dead Vol / Air 0.083 22.9750 0.0000 0.350 0.6520 0.0000 Ambient H2O 171.3780 Ambient H2O 0.383 0.0000

Lav Hallic. Looi

Client ID: PreCal

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 07:33:12

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

194.3530

0.0000

Lab Haille. ECOI

Client ID: PreCal Analysis date: 05/22/2018 07:33:12

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

3.5050

Components: eto2-100.cpt
Data file: 2SterGP2018-C01.CHR (c:\peak359)
Sample: 100 ppm EtO std Components: eto1-100.cpt Data file: 1SterGP2018-C01.CHR (c:\peak359)
Sample: 100 ppm EtO std Operator: D. Kremer Operator: D. Kremer -51.200 512.000 -6.400 64.000 0.0000/Units 0.1250/0.000 8.5820/0.083 Dead Vol / Air 0.0000/ 0.1685/0.250 0.0000/ Dead Vol / Air Ambient H2O 1.3805/0.333 0.0000/ > 37.1210/0.516 0.0000/ppm 162.3490/0,516 0.0000/ppm Ethylene Oxide unknown 0,2540/0.800 0.0000/ Component Retention Area External Units Component Retention Area **External Units**

Dead Vol / Air

Ambient H2O

Acetaldehyde

Ethylene Oxide

Lav Hallio. Lve

Client ID: PreCal Analysis date: 05/22/2018 07:36:31

Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.083

0.333

0.516

0.783

8.5820

1.3805

0.0535 172.3650

162.3490

0.0000

0.0000 0.0000 ppm

0.0000

0.0000

Lab Hairie. ECOI

Client ID: PreCal

Analysis date: 05/22/2018 07:36:31 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.250

0.516

0.1685

37.1210

37.2895

0.0000

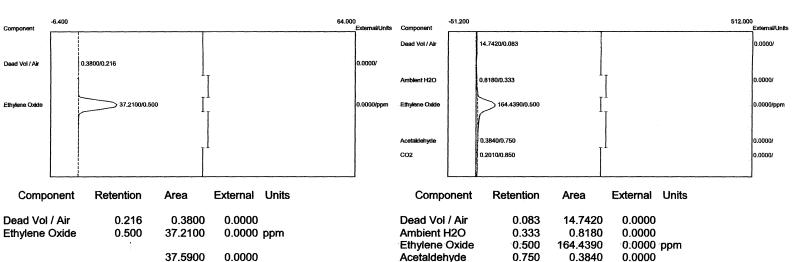
0.0000

0.0000 ppm

Lab Haille. LUGI Client: Sterigenics - Grand Prairie Client: Sterigenics - Grand Prairie Client ID: PreCal Client ID: PreCal Analysis date: 05/22/2018 07:40:40 Analysis date: 05/22/2018 07:40:40 Method: Direct Injection Method: Direct Injection Description: CHANNEL 1 - FID Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterGP2018-C02.CHR (c:\peak359)

Data file: 1SterGP2018-C02.CHR (c:\peak359)
Sample: 100 ppm EtO std Operator: D. Kremer

Sample: 100 ppm EtO std Operator: D. Kremer



CO2

0.0000

0.0000

0.2010 180.5840

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterGP2018-C03.CHR (c:\peak359) Data file: 1SterGP2018-C03.CHR (c:\peak359) Sample: 100 ppm EtO std Sample: 100 ppm EtO std Operator: D. Kremer Operator: D. Kremer 64.000 -51.200 512.000 -6.400 4.9280/0.066 Dead Vol / Air 0.0000/ 0.1420/0.233 0.0000/ Dead Vol / Air > 37.4140/0.500 0.0000/ppm 164.1660/0.500 Ethylene Oxide 0.0000/ppm 0.1190/0.783 0.1070/0.833 0.0000/ 0.0000/ Acetal CO2 External Units Component Component Retention Area Retention Area External Units Dead Vol / Air 0.233 0.1420 0.0000 Dead Vol / Air 0.066 4.9280 0.0000 0.0000 ppm Ethylene Oxide 0.500 37.4140 0.0000 ppm Ethylene Oxide 0.500 164.1660

Acetaldehyde

CO2

Lad Haille. Ecol

Client ID: PreCal Analysis date: 05/22/2018 07:44:39

Carrier: HELIUM Temp. prog: eto-100.tem

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.783

0.833

0.1190

0.1070

169.3200

0.0000

0:0000

0.0000

Lab name: ECSI

Client ID: PreCal

Analysis date: 05/22/2018 07:44:39 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

37.5560

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-C04.CHR (c:\peak359) Data file: 2SterGP2018-C04.CHR (c:\peak359) Sample: 10.1 ppm EtO std Sample: 10.1 ppm EtO std Operator: D. Kremer Operator: D. Kremer 128.000 External/Unit 8.000 -12.800 -0.800 Component Dead Vol / Air 8.9105/0.166 0.0000/ Dead Vol / Air 0.3580/0.200 0.0000/ 16.6175/0.500 0.0000/ppn 0.3945/0.733 0.0000/ CO2 0.0750/0.850 0.0000/ Component Retention **External Units** Component External Units Area Retention Area Dead Vol / Air 0.200 0.3580 0.0000 Dead Vol / Air 0.166 8.9105 0.0000

Ethylene Oxide

Acetaldehyde

CO2

Lav Hallio. Loci

Client ID: PreCal Analysis date: 05/22/2018 07:47:20

Carrier: HELIUM

Method: Direct Injection

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Client: Sterigenics - Grand Prairie

0.500

0.733

0.850

16.6175

0.3945

0.0750

25.9975

0.0000 ppm

0.0000

0.0000

0.0000

Lab Hallie. EUSI

Client ID: PreCal

Analysis date: 05/22/2018 07:47:20 Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

3.8080

4.1660

0.0000 ppm

Lab Hallie. ECOI Client: Sterigenics - Grand Prairie Client ID: PreCal Analysis date: 05/22/2018 07:51:18

Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-C05.CHR (c:\peak359)

Sample: 10.1 ppm EtO std Operator: D. Kremer

Client: Sterigenics - Grand Prairie Client ID: PreCal

Analysis date: 05/22/2018 07:51:18 Method: Direct Injection Description: CHANNEL 2 - PID

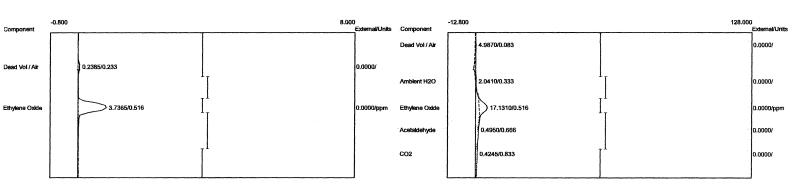
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Lav Hallio. Lyci

Data file: 2SterGP2018-C05.CHR (c:\peak359)
Sample: 10.1 ppm EtO std

Operator: D. Kremer



Component	Retention	Area	External	Units	Component	Retention	Area	External Units
Dead Vol / Air	0.233	0.2385	0.0000		Dead Vol / Air	0.083	4.9870	0.0000
Ethylene Oxide	0.516	3.7365	0.0000	ppm	Ambient H2O	0.333	2.0410	0.0000
•				•	Ethylene Oxide	0.516	17.1310	0.0000 ppm
		3.9750	0.0000		Acetaldehyde	0.666	0.4950	0.0000
					CO2	0.833	0.4245	0.0000

25.0785 0.0000

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: PreCal Analysis date: 05/22/2018 07:55:38

Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-C06.CHR (c:\peak359)

Sample: 10.1 ppm EtO std

Operator: D. Kremer

Lad Haille. Ecol Client: Sterigenics - Grand Prairie

Client ID: PreCal

Analysis date: 05/22/2018 07:55:38 Method: Direct Injection Description: CHANNEL 2 - PID

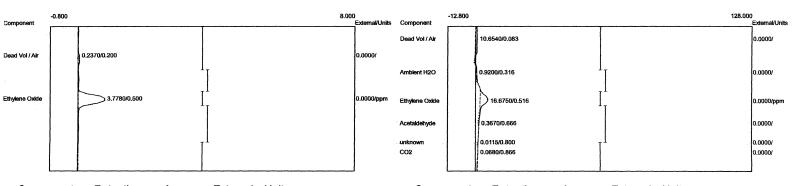
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterGP2018-C06.CHR (c:\peak359)

Sample: 10.1 ppm EtO std

Operator: D. Kremer



Component	Retention	Area	External Units	Component	Retention	Area	External Units
Dead Vol / Air	0.200	0.2370	0.0000	Dead Vol / Air	0.083	10.6540	0.0000
Ethylene Oxide	0.500	3.7780	0.0000 ppm	Ambient H2O	0.316	0.9200	0.0000
				Ethylene Oxide	0.516	16.6750	0.0000 ppm
		4.0150	0.0000	Acetaldehyde	0.666	0.3670	0.0000
				CO2	0.866	0.0680	0.0000
						28.6840	0.0000

Sample: 10.4 ppm EtO std 1.10 Operator: D. Kremer 4.000 -3.200 32.000 3.8650/0.166 0.0000/ 1.7160/0.316 0.0000/ Ambient H2O 0.4070/0.500 Ethylene Oxide 1.8875/0.500 0.0000/ppm 0.2440/0.766 0.0000/ Acetaldehyde 0.0110/0.866 CO2 0.0000/ Component Retention Area **External Units** Component Retention Area External Units Ethylene Oxide 0.500 0.4070 0.0000 ppm Dead Vol / Air 0.166 6.8650 0.0000 Ambient H2O 0.316 1.7160 0.00000.4070 0.0000 Ethylene Oxide 0.500 1.8875 0.0000 ppm Acetaldehyde 0.766 0.2440 0.0000 CO2 0.866 0.0110 0.0000

Lau Haille. Looi

Client ID: PreCal

Analysis date: 05/22/2018 08:00:17 Method: Direct Injection

Description: CHANNEL 2 - PID

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

10.7235

0.0000

Lab name: ECSI

Client ID: PreCal Analysis date: 05/22/2018 08:00:17

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Data file: 1SterGP2018-C07.CHR (c:\peak359)

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-C08.CHR (c:\peak359) Data file: 2SterGP2018-C08.CHR (c:\peak359) Sample: 19:1 ppm EtO std 1.10 Sample: 101 ppm EtO std 1.10 Onerator D Kremer 32.000 -0.400 4,000 Component Dead Vol / Air 0.1420/0.016 0.0000/ 0.4090/0.500 0.0000/ppm 1.8740/0.483 0.0000/ppr Ethviene Oxide 0.3170/0.600 0.0000/ Acetaldehyde 0.0060/0.800 0.0800/0.850 CO2 **External Units External Units** Component Retention Component Retention Area Area 0.066 Dead Vol / Air 0.016 0.1420 0.0000 Dead Vol / Air 10.3880 0.0000 0.0000 ppm

Ethylene Oxide

Acetaldehyde

CO2

0.0000 ppm

0.0000

Lad Hallie. Ecol

Client ID: PreCal

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:05:27

Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.483

0.600

0.850

1.8740

0.3170

0.0800

12.6590

0.0000

0.0000

0.0000

Lab name: ECSI

Client ID: PreCal Analysis date: 05/22/2018 08:05:27

Method: Direct Injection

Description: CHANNEL 1 - FID

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

0.4090

Lab name: ECSi Cilent: Sterigenics - Grand Prairie Client ID: PreCal Analysis date: 05/22/2018 08:07:48 Method: Direct Injection

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-C09.CHR (c:\peak359)

Sample: 18-1 ppm EtO std 1.16

Operator D Kremer

Lab name: Ecoi Client: Sterigenics - Grand Prairie

Client ID: PreCal

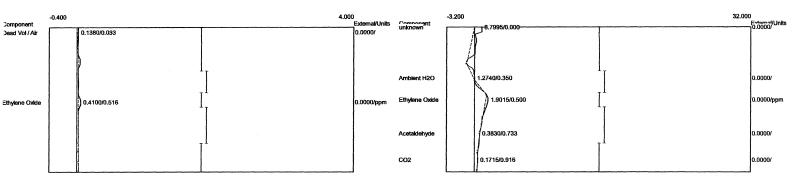
Analysis date: 05/22/2018 08:07:48 Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterGP2018-C09.CHR (c:\peak359)
Sample: 19-1 ppm EtO std 1.10

Operator D Kremer



Component	Retention	Area	External Units	Component	Retention	Area	External Units	
Dead Vol / Air	0.033	0.1380	0.0000	Ambient H2O	0.350	1.2740	0.0000	
Ethylene Oxide	0.516	0.4100	0.0000 ppm	Ethylene Oxide	0.500	1.9015	0.0000 ppm	
-				Acetaldehyde	0.733	0.3830	0.0000	
		0.5480	0.0000	CO2	0.916	0.1715	0.0000	
						3.7300	0.0000	

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: PreCal Analysis date: 05/22/2018 08:07:44 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-C10.CHR (c:\peak359)

Sample: 48.8 ppm EtO std

Onerator: D Kremer

Lab name: ECOI

Cilent: Sterigenics - Grand Prairie Client ID: PreCal Analysis date: 05/22/2018 08:07:44

Method: Direct Injection

Description: CHANNEL 2 - PID

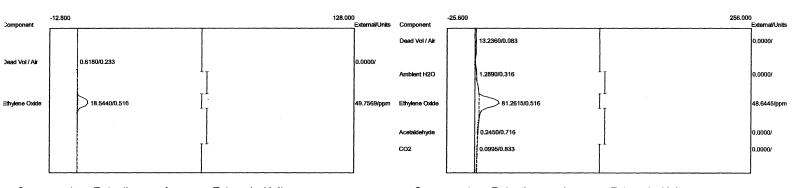
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterGP2018-C10.CHR (c:\peak359)

Sample: 48.8 ppm EtO std

Operator: D. Kremer



Component	Retention	Area	External Units	Component	Retention	Area	External Units
Dead Vol / Air	0.233	0.6180	0.0000	Dead Vol / Air	0.083	13.2360	0.0000
Ethylene Oxide	0.516	18.5440	49.7569 ppm	Ambient H2O	0.316	1.2890	0.0000
				Ethylene Oxide	0.516	81.2615	48.6445 ppm
		19.1620	49.7569	Acetaldehyde	0.716	0.2450	0.0000
				CO2	0.833	0.0995	0.0000

96.1310 48.6445

Lab name: ECSi
Ciìent: Sterigenics - Grand Prairie
Client ID: PostCal
Analysis date: 05/22/2018 15:12:02
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt

Data file: 1SterGP2018-C11.CHR (c:\peak359)

Sample: 48.8 ppm EtO std

Operator: D Kremer

Lab name: EUSI
Cilent: Sterigenics - Grand Prairie

Client ID: PostCal Analysis date: 05/22/2018 15:12:02

Method: Direct Injection
Description: CHANNEL 2 - PID

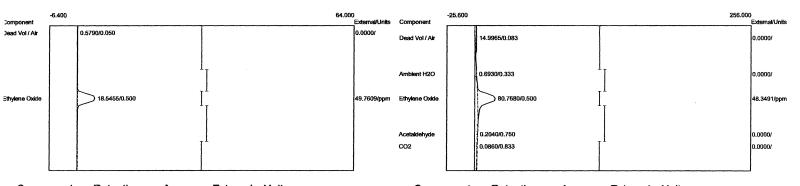
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt

Data file: 2SterGP2018-C11.CHR (c:\peak359)

Sample: 48.8 ppm EtO std

Operator D Kremer



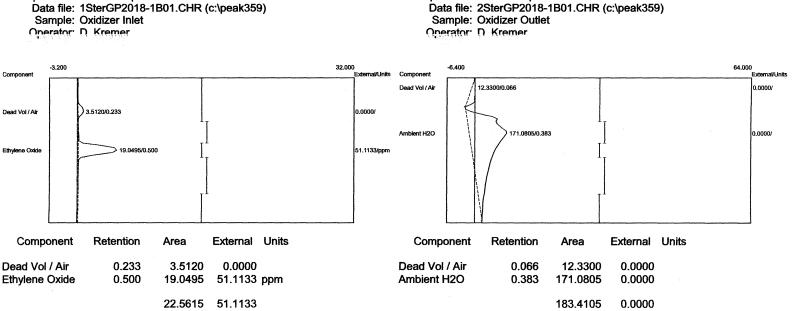
Component	Retention	Area	External Ur	nits	Component	Retention	Area	External Un	nits
Dead Vol / Air	0.050	0.5790	0.0000		Dead Vol / Air	0.083	14.9965	0.0000	
Ethylene Oxide	0.500	18.5455	49.7609 pp	om	Ambient H2O	0.333	0.6930	0.0000	
					Ethylene Oxide	0.500	80.7680	48.3491 ppr	m
		19.1245	49.7609		Acetaldehyde	0.750	0.2040	0.0000	
					CO2	0.833	0.0860	0.0000	

96.7475 48.3491

APPENDIX B

Run #1 Chromatograms - Backvent





Lav Haille, Loci

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 08:49:49

Method: Direct Injection

Description: CHANNEL 2 - PID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Lab Haille. ECOI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

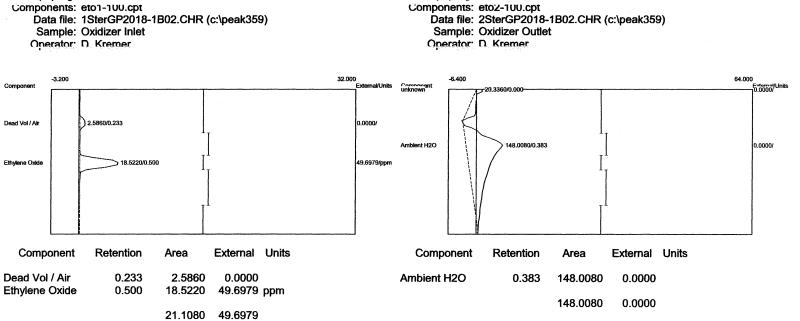
Analysis date: 05/22/2018 08:49:49

Method: Direct Injection

Description: CHANNEL 1 - FID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B



Lad Haille. Ecol

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:50:58

Method: Direct Injection

Description: CHANNEL 2 - PID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Lab name: ECSI

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

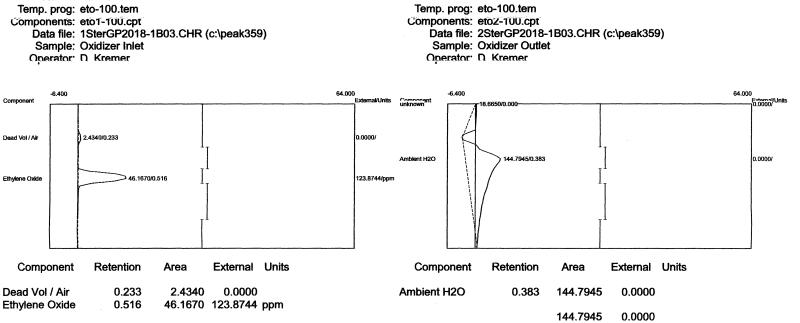
Analysis date: 05/22/2018 08:50:58

Method: Direct Injection

Description: CHANNEL 1 - FID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B



Lab name: EUSI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:52:03

Method: Direct Injection

Description: CHANNEL 2 - PID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Lab name: ECSi

Client ID: Run#1BV

Carrier: HELIUM

Analysis date: 05/22/2018 08:52:03

Method: Direct Injection

Client: Sterigenics - Grand Prairie

48.6010 123.8744

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Data file: 1SterGP2018-1B04.CHR (c:\peak359) Data file: 2SterGP2018-1B04.CHR (c:\peak359) Sample: Oxidizer Outlet
Operator: D. Kremer Sample: Oxidizer Inlet Operator: D Kremer 64.000 External/Unit 0.0000/Units 0.5250/0.000 18.2835/0.066 0.0000/ 2.5105/0.233 0.0000/ 64.9759/ppm Component Retention External Units Component Retention **External Units** Area Area Dead Vol / Air 0.233 2.5105 0.0000 Dead Vol / Air 0.066 18.2835 0.0000

Ambient H2O

64.9759 ppm

64.9759

Lav Hallie. Loui

Client ID: Run#1BV Analysis date: 05/22/2018 08:53:11

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

145.9950

164.2785

0.0000

0.0000

Lab Haine. ECOI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 08:53:11 Method: Direct Injection

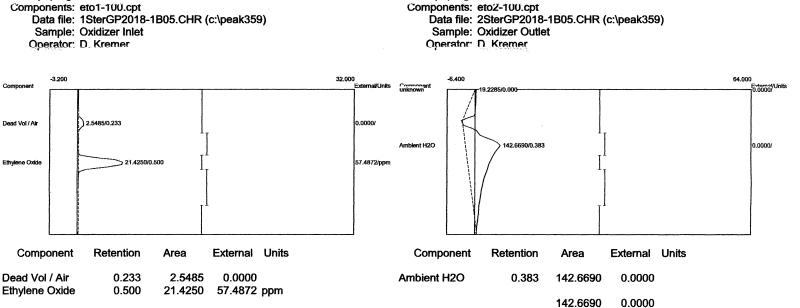
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

24.2160



Lav Haillo, Loui

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:54:18

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Lab Hallie. LCSI

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:54:18

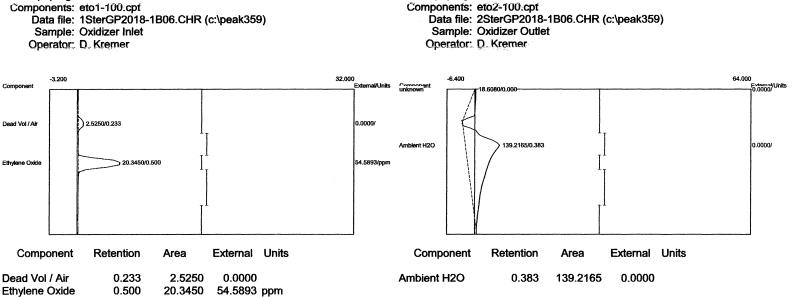
Method: Direct Injection

Description: CHANNEL 1 - FID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

23.9735 57.4872



Lad Hattle. ECOI

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:55:23

Method: Direct Injection

Description: CHANNEL 2 - PID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

139.2165

0.0000

Lab name: EUSI

Client ID: Run#1BV

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:55:23

Method: Direct Injection

Description: CHANNEL 1 - FID

Cilent: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

22.8700

Data file: 2SterGP2018-1B07.CHR (c:\peak359) Data file: 1SterGP2018-1B07.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Dead Vol / Air 15.6980/0.066 0.0000/ 2.7300/0.233 Dead Vol / Air 145.7790/0.383 Ambient H2O 0.0000/ 20.0040/0.500 53.6744/ppm Ethylene Oxide **External Units** External Units Component Retention Area Component Retention Area

Dead Vol / Air

Ambient H2O

Lab Hallie. Looi

Client ID: Run#1BV

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 08:56:36 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.066

0.383

15.6980

145.7790

161.4770

0.0000

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1BV Analysis date: 05/22/2018 08:56:36

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Dead Vol / Air

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B
Carrier: HELIUM

0.233

0.500

0.0000

53.6744

53.6744 ppm

2.7300

20.0040

Data file: 2SterGP2018-1B08.CHR (c:\peak359)
Sample: Oxidizer Outlet Data file: 1SterGP2018-1B08.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 64.000 -3.200 14.8780/0.083 Dead Vol / Air n nnnn/ 2.6080/0.233 0.0000/ 18,4560/0,516 49.5208/ppm Retention External Units Component Retention External Units Component Area Area Dead Vol / Air 0.233 2.6080 0.0000 Dead Vol / Air 0.083 14.8780 0.0000

Ambient H2O

Lab Haille. Looi

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 08:58:13

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

143.5525158.4305

0.0000

0.0000

Lab hame. ECOI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 08:58:13

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

18.4560

21.0640

0.516

49.5208 ppm

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterGP2018-1B09.CHR (c:\peak359) Data file: 1SterGP2018-1B09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D Kremer -3.200 32.000 64.000 Component Dead Vol / Air 15.6435/0.066 0.0000/ 2.7350/0.233 0.0000/ Dead Vol / Air 143.6560/0.383 0.0000/ Ambient H2O 18.5045/0.500 49.6509/ppm Retention **External Units** Component Retention **External Units** Component Area Area

Dead Vol / Air

Ambient H2O

Lau name. Ecoi

Client ID: Run#1BV

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 05/22/2018 08:59:27 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.066

0.383

15.6435

143.6560

159.2995

0.0000

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1BV Analysis date: 05/22/2018 08:59:27

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.233

0.500

2.7350

18.5045

21.2395

0.0000

49.6509

49.6509 ppm

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-1B10.CHR (c:\peak359) Data file: 2SterGP2018-1B10.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Component Component Dead Vol / Air External/Units 12.8900/0.033 4.1140/0.216 Dead Vol / Air 0.0000/ Ambient H2O 145.2460/0.366 18.5385/0.500 49.7422/ppm **External Units** Component Retention Area Component Retention Area **External Units** 4.1140 Dead Vol / Air 0.216 0.0000 Dead Vol / Air 0.033 12.8900 0.0000

Ambient H2O

Lab hame. Ecoi

Client ID: Run#1BV Analysis date: 05/22/2018 09:00:46

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

145.2460

158.1360

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 09:00:46

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

18.5385

22.6525

49.7422 ppm

Client: Sterigenics - Grand Prairie Client: Sterigenics - Grand Prairie Client ID: Run#1BV Client ID: Run#1BV Analysis date: 05/22/2018 09:01:57 Analysis date: 05/22/2018 09:01:57 Method: Direct Injection Method: Direct Injection Description: CHANNEL 1 - FID Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-1B11.CHR (c:\peak359) Data file: 2SterGP2018-1B11.CHR (c:\peak359)

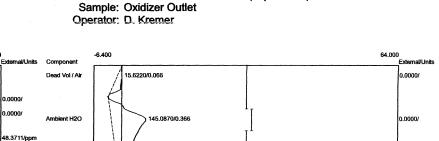
Data file: 1SterGP2018-1B11.CHR (c:\peak359)
Sample: Oxidizer Inlet
Operator: D. Kremer

Lab name: ECSI

-3.200

Ambient H2O

2.6120/0.233 0.1230/0.333



Component	Retention	Area	External Units	Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.6120	0.0000	Dead Vol / Air	0.066	15.6220	0.0000	
Ambient H2O	0.333	0.1230		Ambient H2O	0.366	145.0870	0.0000	
Ethylene Oxide	0.500	18.0275	48.3711 ppm					
		20.7625	48.3711			160.7090	0.0000	

32.000

Lau Haine. Loui

Client: Sterigenics - Grand Prairie
Client ID: Run#1BV
Analysis date: 05/22/2018 09:03:18
Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto1-100.cpt

Data file: 1SterGP2018-1B12.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Client: Sterigenics - Grand Prairie
Client ID: Run#1BV

Analysis date: 05/22/2018 09:03:18

Method: Direct Injection

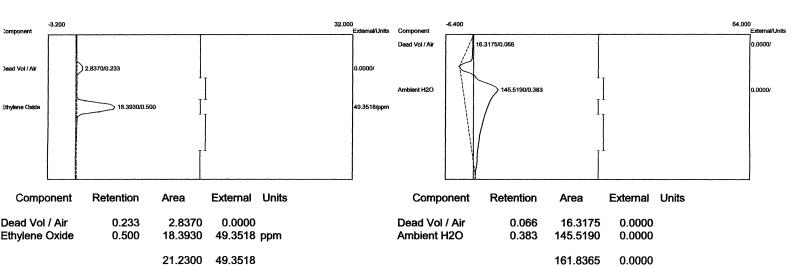
Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt

Data file: 2SterGP2018-1B12.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



APPENDIX C

Run #1 Chromatograms - Aeration



Data file: 1SterGP2018-1A01.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-1A01.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D Kremer -3.200 32.000 -6.400 64.000 Component 4.4720/0.066 Dead Vol / Air 0.0000/ 2.6040/0.233 0.0000/)ead Vol / Air Amblent H2O 142.1500/0.383 0.0000/ :thylene Oxide 19.8040/0.500 53.1377/ppm Component Retention Area **External Units** Component Retention Area **External Units** 0.0000 0.233 2.6040 0.0000 Dead Vol / Air 0.066 Dead Vol / Air 14.4720

Ambient H2O

Client: Sterigenics - Grand Prairie

0.383

142.1500

156.6220

0.0000

0.0000

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 09:27:30 Method: Direct Injection

Lab Hairie. LCCi

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:27:30

Method: Direct Injection
Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

Client: Sterigenics - Grand Prairie

0.500

19.8040

22.4080

53.1377 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-1A02.CHR (c:\peak359) Data file: 2SterGP2018-1A02.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -3.200 4.4630/0.083 Dead Vol / Air 0.0000/ 2.6240/0.233 0.0000/ Ambient H2O 146.8740/0.383 0.0000/ > 19.4120/0.500 Component Retention External Units Component Retention **External Units** Area Area Dead Vol / Air 0.233 2.6240 0.0000 Dead Vol / Air 0.083 14.4630 0.0000

Ambient H2O

52.0859 ppm

52.0859

Lan Hame. Ecol

Client ID: Run#1Aer

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 09:32:54 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

146.8740

161.3370

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1Aer Analysis date: 05/22/2018 09:32:54

Temp. prog: eto-100.tem

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B
Carrier: HELIUM

0.500

19.4120

Data file: 2SterGP2018-1A03.CHR (c:\peak359)
Sample: Oxidizer Outlet Data file: 1SterGP2018-1A03.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32,000 -6.400 -3.200 64.000 Component External/Units 13.9795/0.050 Dead Vol / Air 0.0000/ Dead Vol / Air 2.5500/0.216 0.0000/ 150.1795/0.366 0.0000/ > 19.8715/0.500 53.3188/ppm External Units Component Retention Area **External Units** Component Retention Area Dead Vol / Air 0.216 2.5500 0.0000 Dead Vol / Air 0.050 0.0000 13.9795 Ethylene Oxide 0.500 19.8715 53.3188 ppm Ambient H2O 0.366 150.1795 0.0000

Lay Hallio. Loci

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 09:37:33

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

164.1590

0.0000

Lab Hallie. ECOI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 09:37:33

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

22.4215 53.3188

Data file: 1SterGP2018-1A04.CHR (c:\peak359) Data file: 2SterGP2018-1A04.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -3.200 32.000 Component 15.7350/0.083 Dead Vol / Air 0.0000/ 2.4525/0.233 Dead Vol / Air 0.0000/ 0.1620/0.350 0.0000/ Ambient H2O Ambient H2O 144.2555/0.400 0.0000/ > 20.5240/0.516 Ethylene Oxide 55.0696/ppm Component Retention Area **External Units** Component Retention External Units Area Dead Vol / Air 0.233 2.4525 0.0000 Dead Vol / Air 0.083 15.7350 0.0000 Ambient H2O 0.350 0.1620 0.0000 Ambient H2O 0.400 144.2555 0.0000

Lav Hallio. Loci

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 09:42:04

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

159.9905

0.0000

Lab Haille. LCOI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:42:04

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.516

20.5240

23.1385 55.0696

55.0696 ppm

Data file: 1SterGP2018-1A05.CHR (c:\peak359) Data file: 2SterGP2018-1A05.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units -3.200 64.000 Component Dead Vol / Air 13.4750/0.050 0.0000/ 0.0000/ 0.1625/0.333 Ambient H2O 0.0000/ 149.4590/0.383 0.0000/ > 21.6310/0.500 58.0399/ppm External Units Component Retention Area Component Retention Area External Units Dead Vol / Air 0.216 0.0000 Dead Vol / Air 0.050 2.4230 13.4750 0.0000 Ambient H2O 0.333 0.1625 0.0000 Ambient H2O 0.383 149.4590 0.0000 58.0399 ppm

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.0000

162.9340

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 09:47:33

Method: Direct Injection

Description: CHANNEL 2 - PID

J Haine. LOO

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:47:33

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

21.6310

24.2165 58.0399

Data file: 2SterGP2018-1A06.CHR (c:\peak359) Data file: 1SterGP2018-1A06.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 4.9430/0.083 2.5490/0.233 0.0000/ Dead Vol / Air Ambient H2O 148.1090/0.383 > 25.3660/0.500 Ethylene Oxide 68.0616/ppm Retention **External Units** Component Retention External Units Component Area Area Dead Vol / Air 0.233 2.5490 0.0000 Dead Vol / Air 0.083 14.9430 0.0000

Ambient H2O

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

148.1090

163.0520

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 09:52:05

Method: Direct Injection

Description: CHANNEL 2 - PID

rianic. Loci

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:52:05

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

25.3660

27.9150

68.0616 ppm

Data file: 1SterGP2018-1A07.CHR (c:\peak359) Data file: 2SterGP2018-1A07.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Component Dead Vol / Air .0000/ 2.3985/0.233 Dead Vol / Air 0.0000/ 0.1610/0.350 0.0000/ Ambient H2O Ambient H2O 146.3510/0.383 0.0000/ > 25.5940/0.516 68.6734/ppm Ethylene Oxide Component Retention Area **External Units** Component Retention Area **External Units** 0.0000 Dead Vol / Air 0.233 2.3985 Dead Vol / Air 0.083 14.2090 0.0000

Ambient H2O

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

146.3510

160.5600

0.0000

0.0000

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 09:57:11

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.350

0.516

0.0000

68.6734

68.6734 ppm

0.1610

25.5940

28.1535

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ambient H2O

Ethylene Oxide

Analysis date: 05/22/2018 09:57:11

Method: Direct Injection

Description: CHANNEL 1 - FID

Data file: 1SterGP2018-1A08.CHR (c:\peak359) Data file: 2SterGP2018-1A08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32.000 -6.400 64.000 -3.200 4.0295/0.100 0.0000/ 2.3760/0.233 0.0000/ Dead Vol / Air 0.1440/0.350 0.0000/ Ambient H2O Ambient H2O 149.5230/0.383 65.0524/ppm > 24.2445/0.516 Ethylene Oxide Component Retention Area **External Units** Component Retention Area **External Units** 0.0000 Dead Vol / Air 0.233 2.3760 Dead Vol / Air 0.100 14.0295 0.0000

Ambient H2O

Client: Sterigenics - Grand Prairie

0.383

149.5230

163.5525

0.0000

0.0000

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 10:02:03 Method: Direct Injection

Lab Haille. LUCI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ambient H2O

Ethylene Oxide

Analysis date: 05/22/2018 10:02:03

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.350

0.516

0.1440

24.2445

26.7645 65.0524

0.0000

65.0524 ppm

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-1A09.CHR (c:\peak359) Data file: 2SterGP2018-1A09.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 64.000 -3.200 Component 20.1085/0.083 Dead Vol / Air 0.0000/ 2.4420/0.233 0.0000/ 0.0000/ Ambient H2O 166.9710/0.383 > 24.2330/0.500 65.0215/ppm Ethylene Oxide Component Retention External Units Component Retention **External Units** Area Area Dead Vol / Air 0.233 2.4420 0.0000 Dead Vol / Air 0.083 20.1085 0.0000

Ambient H2O

Lad Haille. Ecol

Client ID: Run#1Aer

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 10:07:01

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

166.9710

187.0795

0.0000

0.0000

Lab name: ECSI

Client ID: Run#1Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 10:07:01 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

Ethylene Oxide

24.2330

26.6750

65.0215 ppm

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterGP2018-1A10.CHR (c:\peak359) Data file: 1SterGP2018-1A10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units -3.200 64.000 Dead Vol / Air 42.3435/0.083 0.0000/ 4.6820/0.233 0.0000/ Dead Vol / Air 170.1230/0.383 0.0000/ Ambient H2O 24.7590/0.500 66.4329/ppm Ethylene Oxide Component Retention Area **External Units** Component Retention **External Units** Area Dead Vol / Air 0.233 0.0000 4.6820 Dead Vol / Air 0.083 42.3435 0.0000

Ambient H2O

66.4329 ppm

66.4329

Lad Hallie. Ecol

Client ID: Run#1Aer

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 10:12:14

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

170.1230

212.4665

0.0000

0.0000

Lab name: EUSI

Client ID: Run#1Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 10:12:14

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

24.7590

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-1A11.CHR (c:\peak359) Data file: 2SterGP2018-1A11.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -3.200 32.000 -6.400 21.5380/0.083 Dead Vol / Air 0.0000/ Dead Vol / Air 2.3600/0.233 0.0000/ 0.1340/0.350 Ambient H2O 0.0000/ Ambient H2O 180.9955/0.383 0.0000/ 23.5680/0.516 63.2372/ppm Component Retention Area External Units Component Retention Area **External Units**

Dead Vol / Air

Ambient H2O

Lad Hallie. Ecol

Client ID: Run#1Aer

Carrier: HELIUM

Analysis date: 05/22/2018 10:17:26 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.083

0.383

21.5380

180.9955

202.5335

0.0000

0.0000

0.0000

Lab name: ECSI

Dead Vol / Air

Ambient H2O

Ethylene Oxide

Client ID: Run#1Aer Analysis date: 05/22/2018 10:17:26

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.233

0.350

0.516

2.3600

0.1340

23.5680

26.0620

0.0000

0.0000

63.2372

63.2372 ppm

Description: CHANNEL 2 - PID Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Carrier: HELIUM Column: 1% SP-1000, Carbopack B Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-1A12.CHR (c:\peak359) Data file: 2SterGP2018-1A12.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 -3.200 -6.400 64.000 Dead Vol / Air 23.8240/0.083 0.0000/ 2.5500/0.233 0.0000/ 187.2230/0.383 Ambient H2O 0.0000/ > 24.7770/0.500 66.4812/ppm

Lad Hame, Ecoi

Client ID: Run#1Aer

Analysis date: 05/22/2018 10:22:02

Method: Direct Injection

Client: Sterigenics - Grand Prairie

External Units External Units Component Retention Component Retention Area Area Dead Vol / Air 0.233 0.0000 2.5500 Dead Vol / Air 0.083 23.8240 0.0000 Ethylene Oxide 0.500 24.7770 66.4812 ppm Ambient H2O 0.383 187.2230 0.0000 27.3270 66.4812 211.0470 0.0000

Lab name: ECSI

Client ID: Run#1Aer Analysis date: 05/22/2018 10:22:02

Method: Direct Injection

Client: Sterigenics - Grand Prairie

APPENDIX D

Run #2 Chromatograms - Backvent



Data file: 1SterGP2018-2B01.CHR (c:\peak359) Data file: 2SterGP2018-2B01.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 16.0740/0.066 Dead Vol / Air 0.0000/ 2.6860/0.233 0.0000/ Ambient H2O 150.4380/0.383 0.0000/ 52.8761/ppm Component Retention Area **External Units** Component Retention Area **External Units** Dead Vol / Air 0.233 2.6860 0.0000 Dead Vol / Air 0.066 16.0740 0.0000 0.383 Ethylene Oxide 0.500 19.7065 52.8761 ppm Ambient H2O 150.4380 0.0000

Lab Haille. Loui

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 09:11:23

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.0000

166.5120

Lab name: ECSI

Client ID: Run#2BV

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 09:11:23 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

22.3925

Data file: 2SterGP2018-2B02.CHR (c:\peak359) Data file: 1SterGP2018-2B02.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -6.400 64.000 -6.400 64.000 Component 22.9290/0.066 Dead Vol / Air 0.0000/ 2.5750/0.233 0.0000/ Dead Vol / Air 0.1280/0.350 0.0000/ Ambient H2O Ambient H2O 141.1420/0.383 0.0000/ **→** 43.0115/0.516 115.4077/ppm Ethylene Oxide Component Retention Area External Units Component Retention Area **External Units** 0.0000 Dead Vol / Air Dead Vol / Air 0.233 2.5750 0.066 22.9290 0.0000 Ambient H2O 0.350 0.1280 0.0000 Ambient H2O 0.383 141.1420 0.0000

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

164.0710

0.0000

Client ID: Run#2BV Analysis date: 05/22/2018 09:12:32

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Lab Hallie. LUSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 09:12:32

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.516

Ethylene Oxide

43.0115 115.4077 ppm

45.7145 115.4077

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-2B03.CHR (c:\peak359) Data file: 2SterGP2018-2B03.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -6.400 64.000 -6.400 64.000 External/Units 2.6860/0.216 Dead Vol / Air 0.0000/ Ambient H2O 141.9820/0.366 29.8870/0.500 80.1923/ppm Ethylene Oxide Component Retention External Units Retention Area Component Area **External Units**

Ambient H2O

Lab name: Ecoi

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 09:13:41

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

141.9820

141.9820

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 05/22/2018 09:13:41

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.216

0.500

2.6860

29.8870

32.5730

0.0000

80.1923

80.1923 ppm

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-2B04.CHR (c:\peak359) Data file: 2SterGP2018-2B04.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 64.000 64.000 -6.400 Component 3.5945/0.033 Dead Vol / Air 0.0000/ 2.5220/0.233 Dead Vol / Air Ambient H2O 144.8470/0.366 0.0000/ 22.9630/0.500 61.6139/ppm Component Retention **External Units** Component Retention External Units Area Area

Dead Vol / Air

Ambient H2O

Lan Hallie. Looi

Client ID: Run#2BV Analysis date: 05/22/2018 09:15:01

Carrier: HELIUM Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.033

0.366

13.5945

144.8470

158.4415

0.0000

0.0000

0.0000

Lab hame. ECSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Analysis date: 05/22/2018 09:15:01 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.233

0.500

2.5220

22.9630

25.4850

0.0000

61.6139

61.6139 ppm

Data file: 1SterGP2018-2B05.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-2B05.CHR (c:\peak359)
Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 64.000 Component 16.0825/0.083 Dead Vol / Air 0.0000/ 2.6540/0.233 Dead Vol / Air 0.0000/ 143.2970/0.383 0.0000/ 57.1129/ppm External Units Component Retention Area Component Retention Area External Units Dead Vol / Air 0.233 2.6540 0.0000 Dead Vol / Air 0.083 16.0825 0.0000

Ambient H2O

Lab Haine. Loci

Client ID: Run#2BV Analysis date: 05/22/2018 09:16:13

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Client: Sterigenics - Grand Prairie

0.383

143.2970

159.3795

0.0000

0.0000

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

Lab hame. ECSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:16:13

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

21.2855

23.9395

57.1129 ppm

Data file: 2SterGP2018-2B06.CHR (c:\peak359)
Sample: Oxidizer Outlet Data file: 1SterGP2018-2B06.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Com Dead Vol / Air 16.4235/0.050 0.0000/ 2.6130/0.233 0.0000/ Dead Vol / Air Ambient H2O 142.8140/0.383 57.0552/ppm Component Retention External Units Component Retention External Units Area Area Dead Vol / Air 0.233 2.6130 0.0000 Dead Vol / Air 0.050 16.4235 0.0000

Ambient H2O

57.0552 ppm

Client: Sterigenics - Grand Prairie

0.383

142.8140

159.2375

0.0000

0.0000

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Client ID: Run#2BV Analysis date: 05/22/2018 09:17:29

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpf

Method: Direct Injection

Lab Haille. LCOI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:17:29 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

21.2640

23.8770 57.0552

Data file: 1SterGP2018-2B07.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-2B07.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Component 17.3475/0.066 Dead Vol / Air 0.0000/ 2.6030/0.233 0.0000/ Dead Vol / Air Ambient H2O 141.2840/0.383 0.0000/ > 20.4250/0.500 Component Retention Area External Units Component Retention **External Units** Area Dead Vol / Air 0.233 2.6030 0.0000 Dead Vol / Air 0.066 0.0000 17.3475

Ambient H2O

Lav Haine. Loui

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 09:18:44

Method: Direct Injection

Client: Sterigenics - Grand Prairie

0.383

141.2840

158.6315

0.0000

0.0000

Description: CHANNEL 2 - PID
Column: 1% SP-1000, Carbopack B

Lab hame. ECOI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:18:44

Method: Direct Injection

Client: Sterigenics - Grand Prairie

0.500

20.4250

23.0280

54.8040 ppm

54.8040

Description: CHANNEL 1 - FID
Column: 1% SP-1000, Carbopack B

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 2SterGP2018-2B08.CHR (c:\peak359) Data file: 1SterGP2018-2B08.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 -3.200 32.000 -6.400 Component Component 16.4095/0.083 0.0000/ 2.6325/0.233 0.0000/ Dead Vol / Air 0.0000/ Ambient H2O 145.8720/0.383 > 21.0030/0.500 56.3549/ppm **External Units** Retention **External Units** Component Retention Component Area Area

Dead Vol / Air

Ambient H2O

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.083

0.383

16.4095

145.8720

162.2815

0.0000

0.0000

0.0000

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 09:20:01

Method: Direct Injection
Description: CHANNEL 2 - PID

name,

Client ID: Run#2BV Analysis date: 05/22/2018 09:20:01

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.233

0.500

2.6325

21.0030

23.6355

0.0000

56.3549

56.3549 ppm

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: Run#2BV Analysis date: 05/22/2018 09:21:18 Method: Direct Injection
Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-2B09.CHR (c:\peak359)

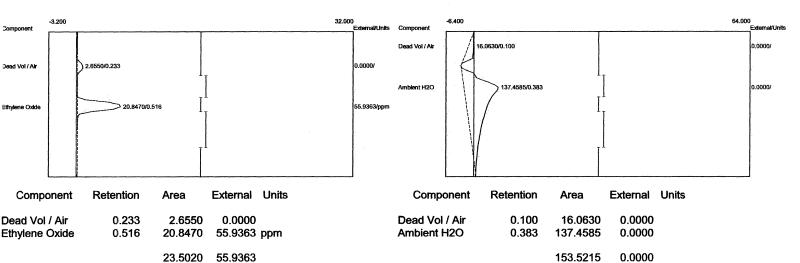
Sample: Oxidizer Inlet Operator: D. Kremer

Lab name. Ecoi Client: Sterigenics - Grand Prairie Client ID: Run#2BV Analysis date: 05/22/2018 09:21:18 Method: Direct Injection Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B
Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterGP2018-2B09.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-2B10.CHR (c:\peak359) Data file: 2SterGP2018-2B10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32.000 -6.400 64.000 -3.200 External/Units Component Component 13.9745/0.083 0.0000/ 2.5985/0.233 0.0000/ Dead Vol / Air Ambient H2O 140.8150/0.383 0.0000/ 6.8647/ppm Retention **External Units** Component Retention External Units Component Area Area Dead Vol / Air 0.233 2.5985 0.0000 Dead Vol / Air 0.083 13.9745 0.0000

Ambient H2O

56.8647 ppm

56.8647

Lab name. Ecoi

Client ID: Run#2BV Analysis date: 05/22/2018 09:23:07

Carrier: HELIUM Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

140.8150

154.7895

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 09:23:07 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.516

21.1930

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-2B11.CHR (c:\peak359) Data file: 2SterGP2018-2B11.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 64.000 16.9140/0.066 0.0000/ 3.6160/0.216 0.0000/ Dead Vol / Air Ambient H2O 142,6520/0.366 58.5121/ppm Retention External Units Component Area Component Retention Area **External Units** Dead Vol / Air 0.216 3.6160 0.0000 Dead Vol / Air 0.066 16.9140 0.0000

Ambient H2O

Lan Hallie. Looi

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 09:24:11

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

142.6520

159.5660

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2BV Analysis date: 05/22/2018 09:24:11

Temp. prog: eto-100.tem

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

21.8070

25.4230

0.500

58.5121 ppm

Data file: 1SterGP2018-2B12.CHR (c:\peak359) Data file: 2SterGP2018-2B12.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Component 17.5175/0.083 Dead Vol / Air 0.0000/ 4.1630/0.233 Dead Vol / Air 0.0000/ Ambient H2O 140.9700/0.383 0.0000/ > 21.6560/0.500 58.1070/ppm Component Retention External Units Component Retention Area External Units Area Dead Vol / Air 0.233 4.1630 0.0000 Dead Vol / Air 0.083 17.5175 0.0000

Ambient H2O

Lav Hallio. Loci

Client ID: Run#2BV Analysis date: 05/22/2018 09:25:20

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

140.9700

158.4875

0.0000

0.0000

Lab hame. ECOI

Client ID: Run#2BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 09:25:20 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

21.6560

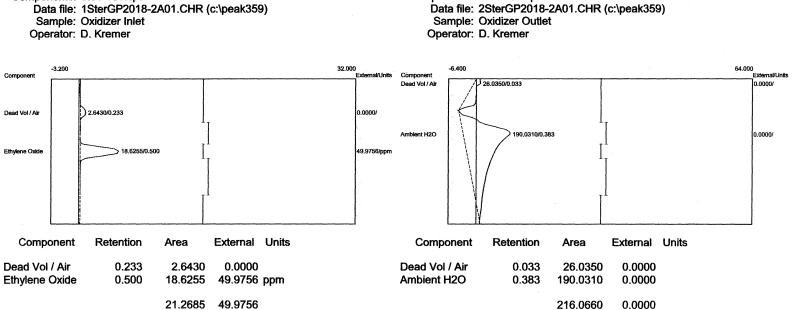
25.8190

58.1070 ppm

APPENDIX E

Run #2 Chromatograms - Aeration





Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 10:27:43

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Haille. LCOI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 10:27:43

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Data file: 1SterGP2018-2A02.CHR (c:\peak359) Data file: 2SterGP2018-2A02.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 2.4690/0.216 Dead Vol / Air 0.0000/ Ambient H2O 189.9230/0.366 0.0000/ 18.6750/0.500 50.1084/ppm Ethylene Oxide **External Units** Component Retention Area Component Retention **External Units** Area 0.216 0.0000 Dead Vol / Air 2.4690 Dead Vol / Air 0.016 21.9475 0.0000

Ambient H2O

Lab Hame. Ecol

Client ID: Run#2Aer Analysis date: 05/22/2018 10:32:18

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

189.9230

211.8705

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 10:32:18

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

18.6750

21.1440

50.1084 ppm

50.1084

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-2A03.CHR (c:\peak359) Data file: 2SterGP2018-2A03.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 Fxte 0.0000/ 2.6000/0.233 0.0000/ 48.2651/ppm Component Retention Area External Units Component Retention **External Units** Area Dead Vol / Air 0.233 2.6000 0.0000 Dead Vol / Air 0.066 26.0545 0.0000

Ambient H2O

Lab Hame. ECO

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 10:37:09

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

191.6190

217.6735

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 10:37:09

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

17.9880

20.5880

48.2651 ppm

Data file: 2SterGP2018-2A04.CHR (c:\peak359) Data file: 1SterGP2018-2A04.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 23.4345/0.083 0.0000/ 2.4430/0.216 Dead Vol / Air 0.0000/ Ambient H2O > 21.5590/0.500 Ethylene Oxide 57.8467/ppm Component Retention **External Units** Component Retention External Units Area Area Dead Vol / Air 0.216 2.4430 0.0000 Dead Vol / Air 0.083 23.4345 0.0000

Ambient H2O

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

189.3590

212.7935

0.0000

0.0000

Client ID: Run#2Aer Analysis date: 05/22/2018 10:42:23

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection
Description: CHANNEL 2 - PID

Lab Haille. LCCI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 10:42:23

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

21.5590

24.0020 57.8467

57.8467 ppm

Data file: 1SterGP2018-2A05.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-2A05.CHR (c:\peak359)
Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 26.9845/0.083 Dead Vol / Air 0.0000/ 2.6135/0.233 Dead Vol / Air 0.0000/ 0.0000/ Ethylene Oxide 21.4865/0.500 57.6522/ppm External Units Component Retention Area External Units Component Retention Area Dead Vol / Air 0.233 2.6135 0.0000 Dead Vol / Air 0.083 26.9845 0.0000

Ambient H2O

Lav Hallio.

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 10:47:25 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

185.8930

212.8775

0.0000

0.0000

Lab Haille. LCOI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 10:47:25

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

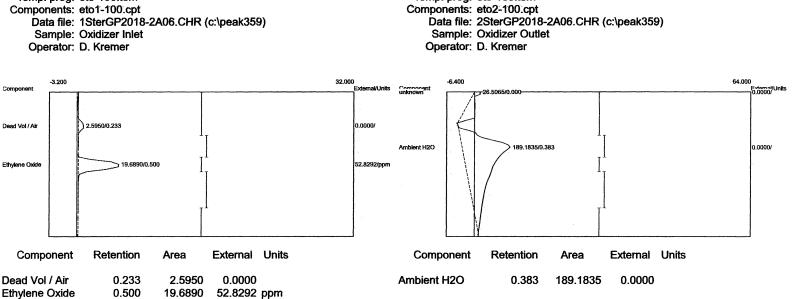
Column: 1% SP-1000, Carbopack B

0.500

21.4865

24.1000 57.6522

57.6522 ppm



Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

189.1835

0.0000

Client ID: Run#2Aer Analysis date: 05/22/2018 10:52:05

Carrier: HELIUM

Temp. prog: eto-100.tem

Method: Direct Injection

Description: CHANNEL 2 - PID

Lab Haille. LOOI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 10:52:05 Method: Direct Injection

Client: Sterigenics - Grand Prairie

22.2840

52.8292

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Data file: 1SterGP2018-2A07.CHR (c:\peak359) Data file: 2SterGP2018-2A07.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Unit -3.200 26.8750/0.100 Dead Vol / Air 0.0000/ 4 5840/0 250 0.0000/ Dead Vol / Air Ambient H2O 187.9445/0.383 0.0000/ 19.9015/0.516 53.3993/ppm Retention External Units Component Retention **External Units** Component Area Area Dead Vol / Air 0.250 4.5840 0.0000 Dead Vol / Air 0.100 26.8750 0.0000 53.3993 ppm Ambient H2O Ethylene Oxide 0.516 19.9015 0.383 187.9445 0.0000

Lav Haine. Loci

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 10:57:31

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.0000

214.8195

Lab Hallie. ECOI

Client ID: Run#2Aer Analysis date: 05/22/2018 10:57:31

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

53.3993

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-2A08.CHR (c:\peak359) Data file: 2SterGP2018-2A08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Component Dead Vol / Air 23.3570/0.016 2.4755/0.233 0.0000/ 0.1520/0.333 0.0000/ 197 3540/0 366 0.0000/ > 19.0470/0.500 51.1066/ppm Ethylene Oxide Retention External Units Component Retention Area **External Units** Component Area Dead Vol / Air 0.233 2.4755 0.0000 Dead Vol / Air 0.016 23.3570 0.0000

Ambient H2O

Lad Haille. Ecol

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Analysis date: 05/22/2018 11:02:42

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

197.3540

220.7110

0.0000

0.0000

0.366

Lab name: ECSI

Client ID: Run#2Aer Analysis date: 05/22/2018 11:02:42

Carrier: HELIUM

Temp. prog: eto-100.tem

Ambient H2O

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.333

0.500

0.0000

51.1066 ppm

0.1520

19.0470

21.6745 51.1066

Data file: 1SterGP2018-2A09.CHR (c:\peak359) Data file: 2SterGP2018-2A09.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 25.9340/0.083 Dead Vol / Air 0.0000/ 2.5760/0.233 Dead Vol / Air 0.0000/ 194.9940/0.383 0.0000/ Amblent H2O 64.2434/ppm External Units Component Retention Area Component Retention Area **External Units** 0.0000 Dead Vol / Air 0.233 2.5760 Dead Vol / Air 0.083 25.9340 0.0000

Ambient H2O

Lav Hailie. Loui

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 11:07:37

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

194.9940

220.9280

0.0000

0.0000

Lab hame. ECOI

Client ID: Run#2Aer

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 11:07:37 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

23.9430

26.5190

64.2434 ppm

Data file: 1SterGP2018-2A10.CHR (c:\peak359) Data file: 2SterGP2018-2A10.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 64.000 External/Unit -3.200 -6.400 24.3250/0.083 Dead Vol / Air 0.0000/ 2.5570/0.233 0.0000/ Dead Vol / Air Ambient H2O 198.4120/0.366 0.0000/ > 23.8310/0.500 63.9429/ppm Component Retention External Units Component Retention **External Units** Area Area Dead Vol / Air 0.233 2.5570 0.0000 Dead Vol / Air 0.083 24.3250 0.0000 Ethylene Oxide 63.9429 ppm Ambient H2O 0.366 0.0000 0.500 23.8310 198.4120

Lad Haille. Ecol

Client ID: Run#2Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 11:12:11 Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

222.7370

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Analysis date: 05/22/2018 11:12:11

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

26.3880

Components: eto1-100.cpt Data file: 2SterGP2018-2A11.CHR (c:\peak359) Data file: 1SterGP2018-2A11.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Component 28.8750/0.083 0.0000/ 2.6030/0.233 0.0000/ 193.2180/0.383 Amblent H2O 0.0000/ 69.5736/ppm Retention External Units Retention External Units Component Area Component Area Dead Vol / Air 0.233 2.6030 0.0000 Dead Vol / Air 0.083 28.8750 0.0000

Ambient H2O

Lad Hallie. Ecol

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 11:17:11

Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

193.2180

222.0930

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 11:17:11

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

25.9295

28.5325

69.5736 ppm

Components: eto1-100.cpt Data file: 1SterGP2018-2A12.CHR (c:\peak359) Data file: 2SterGP2018-2A12.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Component 25.4780/0.083 0.0000/ 2.5180/0.233 0.0000/ Dead Vol / Air 0.0000/ 197.5990/0.383 Ambient H2O 66.8381/ppm > 24.9100/0.500 External Units Component Retention External Units Component Retention Area Area Dead Vol / Air 0.233 2.5180 0.0000 Dead Vol / Air 0.083 25.4780 0.0000

Ambient H2O

66.8381 ppm

66.8381

Lad hame. Ecoi

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 11:22:27 Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

197.5990

223.0770

0.0000

0.0000

Lab name: ECSI

Client ID: Run#2Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Analysis date: 05/22/2018 11:22:27

Method: Direct Injection Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

24.9100

APPENDIX F

Run #3 Chromatograms - Backvent



Data file: 1SterGP2018-3B01.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-3B01.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64,000 Component 20.4660/0.083 2.4065/0.233 0.0000/ Dead Vol / Air Ambient H2O 191.9110/0.383 0.0000/ 62.7596/ppn Component Retention Area **External Units** Component Retention Area External Units 2.4065 Dead Vol / Air 0.233 0.0000 Dead Vol / Air 0.083 20.4660 0.0000 Ethylene Oxide 0.500 23.3900 62.7596 ppm Ambient H2O 0.383 191.9110 0.0000

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

212.3770

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 14:07:10

Method: Direct Injection
Description: CHANNEL 2 - PID

Lab Haille. LCCI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 14:07:10

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

25.7965

Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-3B02.CHR (c:\peak359) Data file: 2SterGP2018-3B02.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 External/Units 64.000 -3.200 28.0210/0.066 0.0000/ 2.3110/0.233 0.0000/ 185.2390/0.383 0.0000/ Ambient H2O 64.6217/ppm Component Retention External Units Component Retention Area **External Units** Area

Dead Vol / Air

Ambient H2O

Lab hame. Ecoi

Client ID: Run#3BV

Carrier: HELIUM

Analysis date: 05/22/2018 14:08:17

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.066

0.383

28.0210

185.2390

213.2600

0.0000

0.0000

0.0000

Lab name: ECSI

Dead Vol / Air

Ethylene Oxide

Client ID: Run#3BV

Analysis date: 05/22/2018 14:08:17

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.233

0.500

2.3110

24.0840

26.3950

0.0000

64.6217

64.6217 ppm

Data file: 1SterGP2018-3B03.CHR (c:\peak359) Data file: 2SterGP2018-3B03.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 64.000 Po.0000/Units 2.3010/0.233 0.0000/ 0.0000/ Amblent H2O 60.5540/ppm Component Retention Area External Units Component Retention Area External Units Dead Vol / Air 0.233 2.3010 0.0000 Ambient H2O 0.383 181.5790 0.0000

Lau Haille. Ecol

Client ID: Run#3BV Analysis date: 05/22/2018 14:09:29

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

181.5790

0.0000

Lab hame. ECSI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 14:09:29

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

22.5680

24.8690

60.5540 ppm

Data file: 1SterGP2018-3B04.CHR (c:\peak359)
Sample: Oxidizer Inlet Data file: 2SterGP2018-3B04.CHR (c:\peak359) Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 0.0000/Units 1 1460/0 000 2.2840/0.233 Dead Vol / Air 0.0000/ Ambient H2O 177.4265/0.383 0.0000/ 22.4190/0.516 60.1543/ppm Ethylene Oxide Component Retention Area **External Units** Component Retention Area **External Units** Dead Vol / Air 0.233 2.2840 0.0000 **Ambient H2O** 0.383 0.0000 177.4265

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

177.4265

0.0000

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 14:10:33 Method: Direct Injection Description: CHANNEL 2 - PID

Lab name.

Ethylene Oxide

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 14:10:33

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.516

22.4190

24.7030

60.1543 ppm

Data file: 1SterGP2018-3B05.CHR (c:\peak359) Data file: 2SterGP2018-3B05.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 64.000 Component 9.8640/0.083 Dead Vol / Air 0.0000/ 2.3890/0.233 Dead Vol / Air 0.0000/ 175.0410/0.383 0.0000/ Ambient H2O 52.3931/ppm Component Retention Area External Units Component Retention Area **External Units** Dead Vol / Air 0.233 2.3890 0.0000 Dead Vol / Air 0.083 19.8640 0.0000 Ethylene Oxide 0.500 19.5265 52.3931 ppm Ambient H2O 0.383 175.0410 0.0000

Lau Haille. Loui

Client ID: Run#3BV Analysis date: 05/22/2018 14:11:47

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

194.9050

0.0000

Lab Hairie. ECSI

Client ID: Run#3BV

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 14:11:47

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

21.9155

Data file: 1SterGP2018-3B06.CHR (c:\peak359) Data file: 2SterGP2018-3B06.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 -6.400 64.000 7.9870/0.083 Dead Vol / Air 0.0000/ 2.4020/0.233 0.0000/ Ambient H2O 172 5400/0 366 0.0000/ 19.6675/0.500 52.7715/ppm External Units Component Retention Area **External Units** Component Retention Area Dead Vol / Air 0.233 2.4020 0.0000 Dead Vol / Air 0.083 17.9870 0.0000 Ethylene Oxide 0.500 52.7715 ppm Ambient H2O 0.366 172.5400 0.0000 19.6675

Lau Haille. Loci

Client ID: Run#3BV Analysis date: 05/22/2018 14:13:07

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.0000

190.5270

Lab hame. ECO

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 14:13:07 Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

22.0695

Data file: 1SterGP2018-3B07.CHR (c:\peak359) Data file: 2SterGP2018-3B07.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32,000 External/Units 64.000 -3.200 Dead Vol / Air 20.2840/0.066 0.0000/ 2.3660/0.233 0.0000/ 0.0000/ Ambient H2O 53.0572/ppm Component Retention Area **External Units** Component Retention Area **External Units** Dead Vol / Air 0.233 2.3660 0.0000 Dead Vol / Air 0.066 20.2840 0.0000

Ambient H2O

Lau Haille. Ecoi

Client ID: Run#3BV

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 14:14:20 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.383

174.8300

195.1140

0.0000

0.0000

Lab name: ECSI

Client ID: Run#3BV Analysis date: 05/22/2018 14:14:20

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

19.774022.1400

Ethylene Oxide

53.0572 ppm

Components: eto1-100.cpt Components: eto2-100.cpt Data file: 2SterGP2018-3B08.CHR (c:\peak359) Data file: 1SterGP2018-3B08.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer 64.000 External/Units -3.200 32.000 Component Dead Vol / Air .6480/0.083 0.0000/ 2.3490/0.233 0.0000/ Ambient H2O 173.4100/0.366 0.0000/ 53.5778/ppm **External Units** Component Retention **External Units** Component Retention Area Area 0.233 0.0000 Dead Vol / Air 0.083 17.6480 0.0000 Dead Vol / Air 2.3490

Ambient H2O

Lau Haille. Looi

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 14:15:36

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.366

173.4100

191.0580

0.0000

0.0000

Lab hame. ECOI

Client ID: Run#3BV Analysis date: 05/22/2018 14:15:36

Carrier: HELIUM

Temp. prog: eto-100.tem

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

19.9680

22.3170

53.5778 ppm

53.5778

Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 0840/0.083 Dead Vol / Air 0.0000/ 2.4020/0.233 Dead Vol / Air 0.0000/ Ambient H2O 174.2340/0.366 58.1660/ppm Retention **External Units** Component Retention External Units Component Area Area Dead Vol / Air 0.233 2.4020 0.0000 Dead Vol / Air 0.083 18.0840 0.0000 0.0000 Ethylene Oxide 0.500 21.6780 58.1660 ppm Ambient H2O 0.366 174.2340

Lau Hallie. Luci

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 14:16:51

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Data file: 2SterGP2018-3B09.CHR (c:\peak359)

0.0000

192.3180

Lab hame. ECSI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 14:16:51

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Data file: 1SterGP2018-3B09.CHR (c:\peak359)

24.0800

Client: Sterigenics - Grand Prairie
Client ID: Run#3BV
Analysis date: 05/22/2018 14:18:04

Method: Direct Injection

Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-3B10.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Client: Sterigenics - Grand Prairie
Client ID: Run#3BV

Analysis date: 05/22/2018 14:18:04 Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

0.083

0.383

19.4660

171.8205

191.2865

0.0000

0.0000

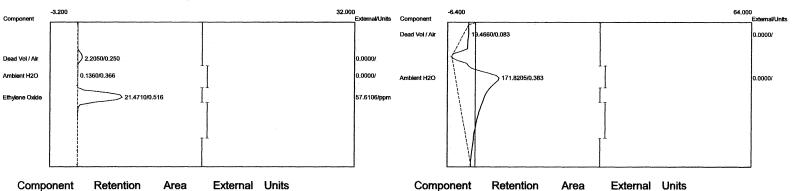
0.0000

Carrier: HELIUM
Temp. prog: eto-100.tem
Components: eto2-100.cpt

Lab hame. Ecoi

Data file: 2SterGP2018-3B10.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Dead Vol / Air

Ambient H2O

Dead Vol / Air	0.250	2.2050	0.0000	
Ambient H2O	0.366	0.1360	0.0000	
Ethylene Oxide	0.516	21.4710	57.6106 ppm	
		23 8120	57 6106	

Data file: 1SterGP2018-3B11.CHR (c:\peak359) Data file: 2SterGP2018-3B11.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 64.000 18.5360/0.033 Dead Vol / Air 0.0000/ 2.3800/0.233 0.0000/ 172.5730/0.383 0.0000/ 56.8996/ppm Component Retention External Units Component Retention Area External Units Area Dead Vol / Air 0.233 2.3800 0.0000 Dead Vol / Air 0.033 18.5360 0.0000

Ambient H2O

Lav Haille. Lvvi

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 14:19:21

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

172.5730

191.1090

0.0000

0.0000

Lab Hairie. ECSI

Client ID: Run#3BV

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 14:19:21

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

21.2060

23.5860

0.500

56.8996 ppm

Data file: 2SterGP2018-3B12.CHR (c:\peak359) Data file: 1SterGP2018-3B12.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Dead Vol / Air 17.5595/0.066 0.0000/ 2.3640/0.233 Ambient H2O 165.9865/0,383 0.0000/ 21.5075/0.516 57.7085/ppm **External Units** Component Retention Area Component Retention **External Units** Area Dead Vol / Air 0.233 2.3640 0.0000 Dead Vol / Air 0.066 17.5595 0.0000

Ambient H2O

Lad Hattle. Ecol

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 14:20:38

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

165.9865

183.5460

0.0000

0.0000

Lab name: ECSI

Client ID: Run#3BV

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 14:20:38

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.516

21.5075

23.8715 57.7085

57.7085 ppm

APPENDIX G

Run #3 Chromatograms - Aeration



Data file: 2SterGP2018-3A01.CHR (c:\peak359)
Sample: Oxidizer Outlet Data file: 1SterGP2018-3A01.CHR (c:\peak359) Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Component 23.7740/0.066 0.0000/ Dead Vol / Air 2.5640/0.233 0.0000/ Dead Vol / Air Ambient H2O 193.6080/0.383 0.0000/ > 22.7370/0.500 61.0075/ppm Component Retention Area External Units Component Retention Area External Units 0.0000 Dead Vol / Air 0.066 0.0000 Dead Vol / Air 0.233 2.5640 23.7740

Ambient H2O

Lav Haille. Lvvi

Client ID: Run#3Aer Analysis date: 05/22/2018 11:27:04

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

193.6080

217.3820

0.0000

Lab Hairie. ECOI

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 11:27:04 Method: Direct Injection

Client: Sterigenics - Grand Prairie

0.500

22.7370

25.3010

61.0075 ppm

61.0075

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Components: eto2-100.cpt Components: eto1-100.cpt Data file: 1SterGP2018-3A02.CHR (c:\peak359) Data file: 2SterGP2018-3A02.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 64.000 Component 23.6170/0.050 Dead Vol / Air 0.0000/ 2.5190/0.233 Dead Vol / Air 0.0000/ 0.1375/0.350 Ambient H2O 0.0000/ 192,4565/0,383 0.0000/ 56.3173/ppm > 20.9890/0.516 Ethylene Oxide Component Retention **External Units** Component Retention External Units Area Area

Dead Vol / Air

Ambient H2O

Lau Haine. Loui

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Analysis date: 05/22/2018 11:32:20 Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.050

0.383

0.0000

0.0000

0.0000

23.6170

192.4565

216.0735

Lab hame: ECSI

Client ID: Run#3Aer Analysis date: 05/22/2018 11:32:20

Carrier: HELIUM

Temp. prog: eto-100.tem

Dead Vol / Air

Ambient H2O

Ethylene Oxide

Method: Direct Injection
Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.233

0.350

0.516

0.0000

0.0000

56.3173

56.3173 ppm

2.5190

0.1375

20.9890

Data file: 1SterGP2018-3A03.CHR (c:\peak359) Data file: 2SterGP2018-3A03.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 64.000 Eviamal/Unit 2.5960/0.233 0.0000/ 56.2905/ppm Component Retention Area **External Units** Component Retention External Units Area Dead Vol / Air 0.233 2.5960 0.0000 Ambient H2O 0.383 199.0330 0.0000

Lau Haille. Loui

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 11:37:24

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

199.0330

0.0000

Lab name: ECOI

Client ID: Run#3Aer

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 11:37:24

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.500

20.9790

23.5750

56.2905 ppm

Data file: 1SterGP2018-3A04.CHR (c:\peak359) Data file: 2SterGP2018-3A04.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 24.9135/0.083 Dead Vol / Air 0.0000/ 2.6085/0.233 Dead Vol / Air 0.0000/ Ambient H2O 197.3680/0.383 0.0000/ > 23.6910/0.500 63.5673/ppm Component Retention Area **External Units** Component Retention External Units Area Dead Vol / Air 0.233 2.6085 0.0000 Dead Vol / Air 0.0000 0.083 24.9135

Ambient H2O

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

197.3680

222.2815

0.0000

0.0000

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 11:42:17

Method: Direct Injection
Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

23.6910

26.2995

63.5673 ppm

63.5673

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 11:42:17

Method: Direct Injection

Description: CHANNEL 1 - FID

Data file: 1SterGP2018-3A05.CHR (c:\peak359) Data file: 2SterGP2018-3A05.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 64.000 Component 24.7825/0.033 Dead Vol / Air 0.0000/ 2.6140/0.233 0.0000/ Ambient H2O 195.2310/0.366 o oooo 63.4438/ppm Component Retention Area External Units Component Retention Area **External Units** Dead Vol / Air 0.233 2.6140 0.0000 Dead Vol / Air 0.033 24.7825 0.0000 0.500 63.4438 ppm Ambient H2O 0.0000

Lan Haille. Looi

Client ID: Run#3Aer

Temp. prog: eto-100.tem

Components: eto2-100.cpt

Analysis date: 05/22/2018 11:47:16

Method: Direct Injection Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

0.366

195.2310

220.0135

0.0000

Lab name: ECSI

Client ID: Run#3Aer Analysis date: 05/22/2018 11:47:16

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

23.6450

26.2590

63.4438

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: Run#3Aer

Analysis date: 05/22/2018 11:52:29 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B

0.500

23.0480

25.6775 61.8420

61.8420 ppm

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-3A06.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Ethylene Oxide

Client ID: Run#3Aer Analysis date: 05/22/2018 11:52:29

Lad Haille. Ecoi

Method: Direct Injection Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto2-100.cpt

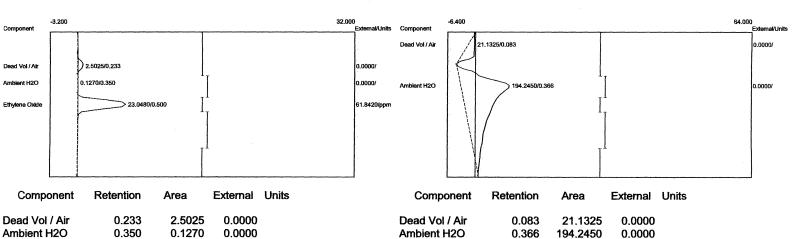
Client: Sterigenics - Grand Prairie

Data file: 2SterGP2018-3A06.CHR (c:\peak359)

215.3775

0.0000

Sample: Oxidizer Outlet Operator: D. Kremer



Data file: 1SterGP2018-3A07.CHR (c:\peak359) Data file: 2SterGP2018-3A07.CHR (c:\peak359) Sample: Oxidizer Outlet Sample: Oxidizer Inlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 21.4495/0.083 Dead Vol / Air 0.0000/ 2.6160/0.233 Dead Vol / Air 0.0000/ 0.0000/ 62.6644/ppm Component Retention External Units Component Retention **External Units** Area Area 0.0000 Dead Vol / Air 0.083 Dead Vol / Air 0.233 2.6160 21.4495 0.0000

Ambient H2O

Lay Haille, Loui

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Analysis date: 05/22/2018 11:57:27

Method: Direct Injection

Description: CHANNEL 2 - PID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.383

193.7640

215.2135

0.0000

0.0000

Lab Haille. ECSI

Client ID: Run#3Aer

Carrier: HELIUM

Temp. prog: eto-100.tem

Components: eto1-100.cpt

Ethylene Oxide

Analysis date: 05/22/2018 11:57:27

Method: Direct Injection

Description: CHANNEL 1 - FID

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

0.500

23.3545

25.9705

62.6644 ppm

62.6644

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: Run#3Aer

Analysis date: 05/22/2018 12:02:18 Method: Direct Injection Description: CHANNEL 1 - FID

Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-3A08.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Client: Sterigenics - Grand Prairie Client ID: Run#3Aer

Analysis date: 05/22/2018 12:02:18

Lad ligitie. Ecol

Method: Direct Injection Description: CHANNEL 2 - PID

Column: 1% SP-1000, Carbopack B

0.100

0.383

23.0840

191.9305

215.0145

0.0000

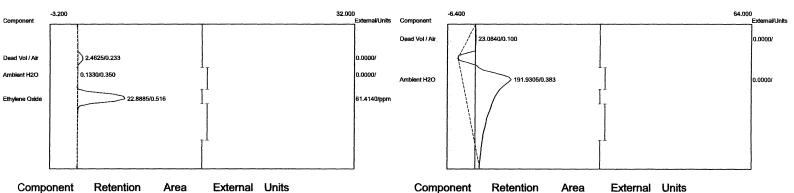
0.0000

0.0000

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Data file: 2SterGP2018-3A08.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Dead Vol / Air

Ambient H2O

Dead Vol / Air	0.233	2.4625	0.0000	
Ambient H2O	0.350	0.1330	0.0000	
Ethylene Oxide	0.516	22.8885	61.4140 ppm	
		25.4840	61.4140	

Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: Run#3Aer Analysis date: 05/22/2018 12:07:15 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-3A09.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Lad hame. Ecol

Client ID: Run#3Aer

Analysis date: 05/22/2018 12:07:15

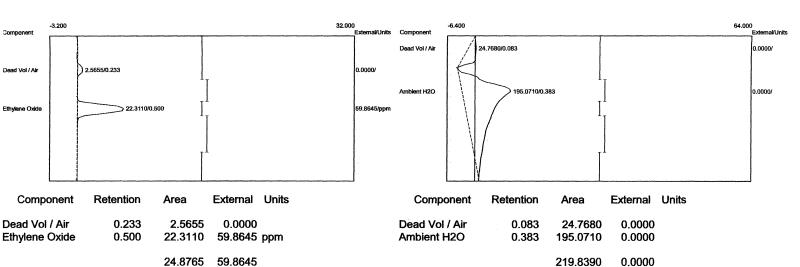
Method: Direct Injection Description: CHANNEL 2 - PID

Data file: 2SterGP2018-3A09.CHR (c:\peak359)

Client: Sterigenics - Grand Prairie

Column: 1% SP-1000, Carbopack B

Sample: Oxidizer Outlet Operator: D. Kremer



Lab name: ECSI Client: Sterigenics - Grand Prairie Client ID: Run#3Aer Analysis date: 05/22/2018 12:12:34 Method: Direct Injection Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto1-100.cpt

Data file: 1SterGP2018-3A10.CHR (c:\peak359)

Sample: Oxidizer Inlet Operator: D. Kremer

Analysis date: 05/22/2018 12:12:34 Method: Direct Injection Description: CHANNÉL 2 - PID

Column: 1% SP-1000, Carbopack B

Client: Sterigenics - Grand Prairie

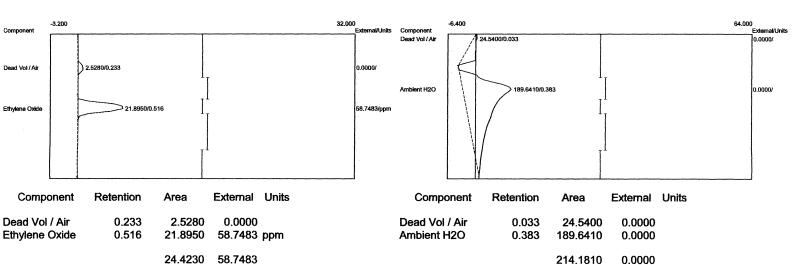
Carrier: HELIUM Temp. prog: eto-100.tem Components: eto2-100.cpt

Lab name: EUSI

Client ID: Run#3Aer

Data file: 2SterGP2018-3A10.CHR (c:\peak359)

Sample: Oxidizer Outlet Operator: D. Kremer



Data file: 1SterGP2018-3A11.CHR (c:\peak359) Data file: 2SterGP2018-3A11.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer 32.000 -6.400 64.000 Component 23.3760/0.083 Dead Vol / Air 0.0000/ Dead Vol / Air 2.4890/0.233 192.7390/0.383 0.0000/ > 21.1370/0.500 6.7144/ppm External Units Component Retention External Units Component Retention Area Area 0.233 0.0000 Dead Vol / Air 0.083 0.0000 Dead Vol / Air 2.4890 23.3760 Ethylene Oxide 0.500 21.1370 56.7144 ppm Ambient H2O 0.383 192.7390 0.0000

Lab name: EUSI

Client ID: Run#3Aer Analysis date: 05/22/2018 12:17:20

Carrier: HELIUM

Temp. prog: eto-100.tem Components: eto2-100.cpt

Method: Direct Injection

Client: Sterigenics - Grand Prairie

216.1150

0.0000

Description: CHANNEL 2 - PID Column: 1% SP-1000, Carbopack B

Lab name: ECSi

Client ID: Run#3Aer

Carrier: HELIUM Temp. prog: eto-100.tem

Components: eto1-100.cpt

Analysis date: 05/22/2018 12:17:20 Method: Direct Injection

Client: Sterigenics - Grand Prairie

23.6260

56.7144

Description: CHANNEL 1 - FID Column: 1% SP-1000, Carbopack B

Analysis date: 05/22/2018 12:22:08 Analysis date: 05/22/2018 12:22:08 Method: Direct Injection Method: Direct Injection Description: CHANNEL 1 - FID Description: CHANNÉL 2 - PID Column: 1% SP-1000, Carbopack B Column: 1% SP-1000, Carbopack B Carrier: HELIUM Carrier: HELIUM Temp. prog: eto-100.tem Temp. prog: eto-100.tem Components: eto1-100.cpt Components: eto2-100.cpt Data file: 1SterGP2018-3A12.CHR (c:\peak359) Data file: 2SterGP2018-3A12.CHR (c:\peak359) Sample: Oxidizer Inlet Sample: Oxidizer Outlet Operator: D. Kremer Operator: D. Kremer -3.200 32.000 -6.400 64.000 Component External/Units Component External/Units 21.0820/0.066 Dead Vol / Air 0.0000/ 2.6165/0.233 0.0000/ Dead Vol / Air Ambient H2O 191.2160/0.383 0.0000/ > 20.0290/0.500 53.7414/ppm

Lab hame. Ecoi

Client ID: Run#3Aer

Client: Sterigenics - Grand Prairie

Component	Retention	Area	External Units	Component	Retention	Area	External	Units
Dead Vol / Air	0.233	2.6165	0.0000	Dead Vol / Air	0.066	21.0820	0.0000	
Ethylene Oxide	0.500	20.0290	53.7414 ppm	Ambient H2O	0.383	191.2160	0.0000	
		22.6455	53.7414			212.2980	0.0000	

Lab name: ECSI

Client ID: Run#3Aer

Client: Sterigenics - Grand Prairie

APPENDIX H

Field Data and Calculation Worksheets



ETHYLENE OXIDE SOURCE TEST/CALIBRATION DATA

	Steriaenic		<u></u>						_ [[
			PR	E CALI	BRATI	ON				
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO	1000 ppm EtO	10080 ppm EtO				
Inlet	Area Counts #1	.407	3.81	37.1		-				
(FID)	Area Counts #25	409,410	3.74 3.78	37.337.4						
	Average Area	.409	3.78	37.2						
		Aud	it Standard	l (48.8 ppm	v) Result/	49.8.	Ŋ			
	Calibration Gas Conc. (ppmv)	1.10 ppm EtO	10.1 ppm EtO	100 ppm EtO						
Outlet	Area Counts #1	1.89	16.6	162						
(PID)	Area Counts #2/3	187,90	17.16.7	164						
	Average Area	1.89	16.8	163						
		Aud	it Standard	(48.8 ppm	v) Result	48.6	9			
ivent ^s	Run #1 0004 0004 0005	Run #2 09190925	Run #3 1406 (42)	\ P _{bar}			EtO Usa	age (lbs/yr		
ivent ^s	Run #1 09143 0904 0435 0435 1025	Run #2 09190125 1025	Run #3	N P _{bar}			EtO Usa	age (lbs/yr Per Week		
event ^s	Run #1 09143 0904 0875 0875 1025	Run #2 09190125 1005-1125	1406 HZ		₂ O:		EtO Usa			
svent ^s tion st	Run #1 ORIGINATION Calibration Gas Conc. (ppmv)	Run #2 0010 000 5 1002 1/25 1.10 ppm EtO	1406 HZ	%Н	₂ O:		EtO Usa			
tion st	1	0919003 1025 1125 1.10	PO:	%H ST CAL 100 ppm	2O:	10 N 10080 ppm	EtO Usa			
	Conc. (ppmv)	0919003 1025 1125 1.10	PO:	%H ST CAL 100 ppm	2O:	10 N 10080 ppm	EtO Usa			
	Conc. (ppmv) Area Counts #1	0919003 1025 1125 1.10	PO:	%H ST CAL 100 ppm	2O:	10 N 10080 ppm EtO	EtO Usa			
	Conc. (ppmv) Area Counts #1 Area Counts #2	1.10 ppm EtO	PO:	%H ST CAL 100 ppm	1BRAT 1000 ppm EtO	10 N 10080 ppm	EtO Usa			
Inlet	Conc. (ppmv) Area Counts #1 Area Counts #2	1.10 ppm EtO	PO:	%H ST CAL 100 ppm EtO	1BRAT 1000 ppm EtO	10 N 10080 ppm EtO	EtO Usa Cycles			
	Conc. (ppmv) Area Counts #1 Area Counts #2 Average Area Calibration Gas	1.10 ppm EtO Aud 1.10	PO: 10.1 ppm EtO 10.1 ppm	%H ST CAL 100 ppm EtO (48.8 ppm) 100 ppm	1BRAT 1000 ppm EtO	10 N 10080 ppm EtO	EtO Usa Cycles			
(FID)	Conc. (ppmv) Area Counts #1 Area Counts #2 Average Area Calibration Gas Conc. (ppmv)	1.10 ppm EtO Aud 1.10	PO: 10.1 ppm EtO 10.1 ppm	%H ST CAL 100 ppm EtO (48.8 ppm) 100 ppm	1BRAT 1000 ppm EtO	10 N 10080 ppm EtO	EtO Usa Cycles			
(FID) Outlet	Conc. (ppmv) Area Counts #1 Area Counts #2 Average Area Calibration Gas Conc. (ppmv) Area Counts #1	1.10 ppm EtO Aud 1.10	PO: 10.1 ppm EtO 10.1 ppm	%H ST CAL 100 ppm EtO (48.8 ppm) 100 ppm	1BRAT 1000 ppm EtO	10 N 10080 ppm EtO	EtO Usa Cycles			

APPENDIX I

Gas Certifications



Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-001 Item No.: 02020001310TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CAL4448 Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

1.10 PPM BALANCE Accuracy (+/-%)

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:	\sim	DATE:	4-20-18
	(MT		

Page 1 of 2

SPECIFICATIONS Component Name	Requested Concentration (Moles)	Certified Concentration (Moles)	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	•
ETHYLENE OXIDE	1. PPM BAL	1.10 PPM BAL	10.0	5.00	

Traceable To

Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure:

1200 PSIG

Expiration Date: 20Apr2020

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.





Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-003 Item No.: 02020001320TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CLM003232 Cylinder Size: CL Certification Date: 20Apr2018 Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

10.1 PPM BALANCE Accuracy (+/-%)

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:		DATE:	4-20-18
	MT '		

Page 1 of 2

SPECIFICATIONS Component Name	Reque Concent (Mol	tration	Certific Concentr (Mole	ration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	10.	PPM	10.1	PPM	1.0	5.00	
NITROGEN		BAL		BAL			

Traceable To

Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure:

1200 PSIG

Expiration Date: 20Apr2020

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



00 CAJON BLVD., SAN BERNARDINO, CA 92411

Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-004 Item No.: 02020001330TCL P.O. No.: VBL - D. KREMER

Cylinder Number: CLM011385 Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE **NITROGEN**

Concentration (Moles)

100.

PPM **BALANCE** (+/-%) 5

Accuracy

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

DATE: <u>4-20-18</u>

1 of 2 Page

SPECIFICATIONS Component Name	Requested Concentration (Moles)		Concent	Certified Concentration (Moles)		nd nce ult %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE NITROGEN	100.	PPM BAL	100.	PPM BAL		. 0	5.00	

Traceable To Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: 1300 PSIG Valve Connection: CGA 350

Expiration Date: 20Apr2020

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-005 Item No.: 02020001340TCL P.O. No.: VBL - D. KREMER

Cylinder Number: CLM002810 Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE **NITROGEN**

Concentration (Moles)

1,000.

PPM **BALANCE** Accuracy (+/-%)

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

DATE: <u>4-20-18</u>

SPECIFICATIONS Component Name	Requested Concentration (Moles)		Certifi Concent (Mol	ration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	1,000.	PPM	1,000.	PPM	.0	5.00	
NITROGEN	•	BAL	•	BAL			

Traceable To Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

1200 PSIG Pressure:

Valve Connection: CGA 350

Expiration Date: 20Apr2020

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.

Single-Certified Calibration Standard



00 CAJON BLVD., SAN BERNARDINO, CA 92411

Phone: 909-887-2571 Fax: 909-887-0549

CERTIFICATE OF ACCURACY: Certified Working Class Calibration Standard

Product Information

Project No.: 02-57164-006 Item No.: 02020001340TCL P.O. No.: VBL – D. KREMER

Cylinder Number: CLM005787

Cylinder Size: CL

Certification Date: 20Apr2018

Customer

ECSI, INC PO BOX 1498

SAN CLEMENTE, CA 92674

CERTIFIED CONCENTRATION

Component Name

ETHYLENE OXIDE NITROGEN

Concentration (Moles)

10,080.

PPM

BALANCE

(+/-%)

Accuracy

5

TRACEABILITY

Traceable To

Scott Reference Standard

APPROVED BY:

P. M. Cully

DATE: 4-20-18

Page 1 of 2

SPECIFICATIONS Component Name	Reque Concen (Mol	tration	Certif Concen (Mol	tration	Blend Tolerance Result (+/- %)	Certified Accuracy Result (+/- %)	
ETHYLENE OXIDE	10,000.	PPM	10,080.	PPM	.8	5.00	
MITTECCEN		BAL		BAL			

Traceable To

Scott Reference Standard

PHYSICAL PROPERTIES

Cylinder Size: CL

Pressure: Expiration Date: 20Apr2020

700 PSIG

Valve Connection: CGA 350

SPECIAL HANDLING INSTRUCTIONS

Do not use or store cylinder at or below the stated dew point temperature. Possible condensation of heavier components could result. In the event the cylinder has been exposed to temperatures at or below the dew point, place cylinder in heated area for 24 hours and then roll cylinder for 15 minutes to re-mix.

Use of calibration standards at or below dew point temperature may result in calibration error.



CERTIFICATE OF ANALYSIS

Customer Name:

Cylinder Number:

SA25925

Stock or Analyzer Tag Number:

N/A

Product Class: Cylinder - Contents¹:

Certified Standard

Customer Reference: MESA Reference:

Verbal- Dan 104448

28 CF @ 2000 PSI

Date of Certification: Recommended Shelf Life: 4/19/2018 2 Years

ECSi, Inc.

Cylinder-CGA: Analysis Method: A006-HP-BR/350

Preparation Method:

GC-TCD/FID Gravimetric

Component

Requested Concentration²

Reported Concentration^{2,3}

Ethylene Oxide Nitrogen

50 ppm Balance

48.8 ppm Balance

Authorized Signature:

1. The fill pressure shown on the COA is as originally quoted. The fill pressure measured by the customer may differ from the fill pressure originally quoted due to temperature effects, compressibility of the individual components when blended together in the cylinder, gauge accuracy or reduction in content volume before shipping as a result of samples withdrawn for laboratory QC necessary to ensure product quality.

Unless otherwise stated, concentrations are given in molar units.

Vapor pressure mixes are blended at a sufficiently low pressure so as to eliminate phase separation under most low temperature conditions encountered during transport or storage. However, it is generally recommended that cylinders containing vapor pressure restricted mixes be placed on the floor in a horizontal position and rolled back and forth to improve homogeneity of the gas phase mixture before being put into service.

Analytical Gas Standards are prepared and analyzed using combinations of NIST traceable weights, SRM's provided by NIST, or internal gas standards that have been verified for accuracy using procedures published by the US-EPA. Pure gases are analyzed and certified for purity using minor component Analytical Gas Standards prepared according to the methods specified above. Balances are calibrated to NIST test weights covered by NIST test number 822/256175/96. Reference Certification #'s: 163/W, 830/N and 3280. Calibration methods are in conformance with MIL-STD 45662A.

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